48120 August 1990

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

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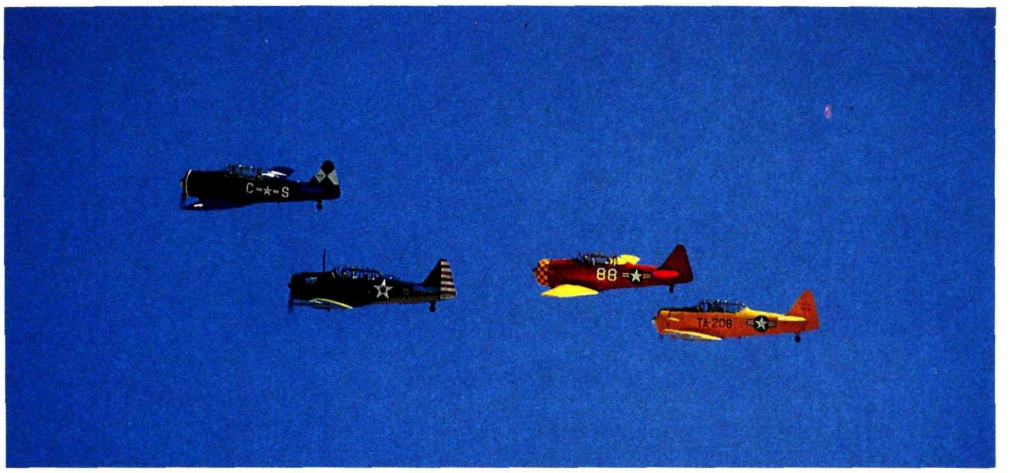
AUGUST 1990 VOLUME 118, NUMBER 8

MODEL AIRPLANE NEWS



ON THE COVER: Mesa, AZ, was the place; scale was the subject; and competition was the name of the game. Some of the entries in this year's Top Gun event surround the winning F-86 built and flown by Top Gun Ron Gilman. For full color coverage, see page 40. Kodachromes by Rich Uravitch.

FEATURES

HELICOPTER SECTION

CONSTRUCTION

COLUMNS

DEPARTMENTS

EDITORIAL

by RICH URAVITCH

Hey, Kid, Wanna Ride?

As a youngster, "thirty-something" years ago, I hung around the old Zahn's airport on Long Island. Like many of you, I bet, I was taking in everything I could about airplanes and aviation. My "puppy love" affair with airborne things hadn't just begun, it was in full bloom! Models had already occupied my attention, and now the "real stuff" was augmenting it. I guess I looked like I wouldn't survive the day unless someone gave me a ride in *some* airplane. The look must have been pretty effective, because I occasionally caught the attention of one of the airplane owners, who said, "Hey, kid, wanna ride?"

Two months ago, I was in Mesa, AZ, attending the Top Gun scale invitational, which we feature in this issue. Right after my arrival, I met with Frank Tiano, founder of the event, and he filled me in on the agenda. The first day's flying would begin with a real P-51 doing a fly-by and victory rollover the field. Frank said that the '51 had a back seat, and my mind immediately flashed back to the question, "Hey, kid, wanna ride?"

On Saturday morning, I hooked up with Bill Hane. He owns a Mustang called "Ho Hun," which, when not airborne, is on static display in Doug Champlin's Fighter Museum, along with other greats like the Fokker, Focke-Wulf, Sabre, MiG and F-4. Bill's '51 is one of the nicest examples of the marque I've seen, so when he offered to let me join the "Ho! Hun P-51 Club," membership in which includes a *mandatory* ride in the Mustang, I jumped—at the chance and into the back seat!

My time-on-target accuracy was a little rusty, but we managed to find the Top Gun flying site only 3 minutes late and while our National Anthem was still playing (I think!). After the fly-by and roll, we headed for the desert and did some low-level work; we skirted ridges, wound between mountains and frequently looked *up* at cacti! We climbed to altitude only to refill the cockpit with cooling ram air, and then back down into the weeds!

After we had returned to the airport, and my excitement level had subsided to that of a kid on Christmas Eve, Bill and I talked about how he had come to own the Mustang. He had been a maintenance technician with the California Air Guard during the time that they were flying '51s, so he got to know the airplane intimately. Sometime later, Bill bought one and lavished much love and attention on it; "Ho Hun" was the result. Talking with Bill, I got the feeling that he has loved airplanes for a very long time. I just never thought to ask who first posed the question to *him*, "Hey, kid, wanna ride?"■

MODEL AIRPLANE NEWS

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AIRWAVES

WHERE TO WRITE TO US
If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

Oscar Deuce?

I really enjoy your magazine, although too much space is devoted to helis. If I flew one (or even knew someone who convinced me that I should), I'd probably appreciate your coverage. For now, I'm more than satisfied with the rest of your publication.

I need some help. I recently saw "Bat 21"—a film about the Vietnam war. The rescue plane was beautiful! (I think it was called an "Oscar Deuce.") It was a push-pull configuration, and it flew like a jackrabbit with wings. Is this the plane's real name? Would it convert well to R/C? Are plans and kits available?

PETER BIRTOLO
Forestdale, MA

C'mon, Pete, have a little understanding for the rotary-wing R/Cers. MAN is just as much for them as it is for fixed-wing guys. Besides, I bet if you tried an R/C heli, you'd enjoy the challenge! I sure did! We've already given cars and boats their own magazines. Do you want the same thing for helis?

The rescue airplane in "Bat 21" is the Oscar Deuce—a militarized variant of the Cessna Skymaster center-line-thrust twin. A kit is available from Royal, and our plan #2 ($9.50 plus P&H) will work for scratchbuilders. According to Charles Waldron (see "Pilot Projects"), it flies well. In its military costume, the Skymaster is designated 0-2—Oscar Deuce. RAU

Abused Structure

I have a stack of *Model Airplane News* magazines, but I've never seen an article on how to build wings that are strong enough to take the abuse of a flying model or the stress testing of an airframe. (Foam wings bother me the most.)

I've seen a lot of planes "pile it in" because of this problem. If you wrote an article on this subject, you'd be a hero to model builders everywhere. Think of the airplanes that could be

saved! Your magazine is the best!

RICK PALUMBO

Rick, most model designs, and certainly most of those that reach the kit-production stage, are structurally well-designed. My guess is that the airplanes you've seen "pile in" were operated well beyond their design limits and that the designer's recommendations for engine size, materials to use or building techniques were ignored. Airplanes are designed to fly and perform; not to crash, and you'll find that most designs are still "overbuilt" and able to withstand the excesses to which they're frequently exposed. Designers do a pretty good job of producing successful, safe, R/C airplanes.

RAU

Time of the Ancient Mariner

During WW II, my father served as a radio operator/gunner on what was probably one of the least-known aircraft of the Pacific campaign—the Martin PBM Mariner.

The Mariner was a long-range patrol bomber that carried eight, 50-inch machine guns, a 4,000-pound bomb load and either depth charges or two, 21-inch torpedoes.

The Mariner was responsible for many Japanese submarine kills, along with a number of daring torpedo raids on Japanese destroyers and battleships. It was also one of the first Naval aircraft to be equipped with the war's "secret weapon"—radar.

I've been looking for a PBM kit or plans for years. Can you help?

LEE RODENBURG
Greenport, NY

Lee, I'm reasonably sure that no Mariner kit is available. We did present a construction article a long time ago, but the plans are no longer available. We do have the scale Willis Nye drawings, which you could scale up to any size. A beautiful, large-scale PBM was entered in the static competition at this year's WRAM show, and my notes indicate that the builder, Ed Zemaitis, has plans available. You might check with him at 3784 Elder Rd., Harrisburg, PA 17111. Good luck.

RAU

You Can't Please All of the People

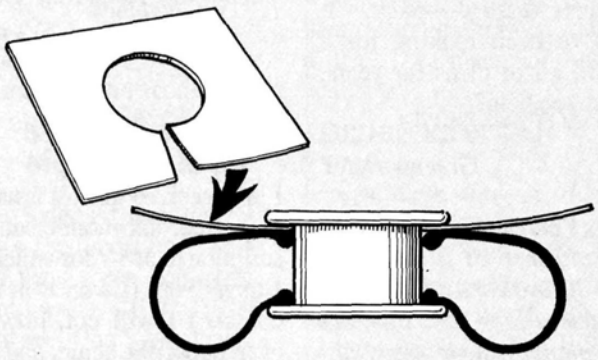
I just received the last issue of a free, six-month subscription to *MAN* for which I thank you. (I won it in a contest.) I will not, however, subscribe again, and I feel compelled to tell you why:

(Continued on page 20)

HINTS & KINKS

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o **Model Airplane News**, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

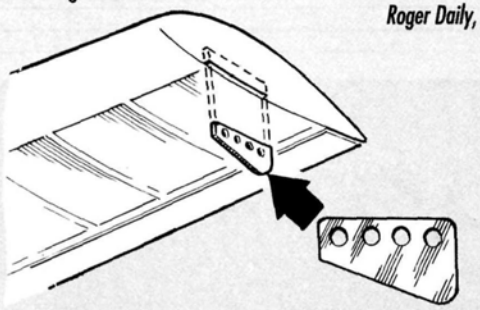
by JIM NEWMAN



MASKING WHEEL HUBS

In a piece of thin card, cut a hole that's just large enough to fit around the wheel hub. Roll the tire downward, insert the card, cover the slit with tape, then paint. Rest assured, paint won't get onto the tire.

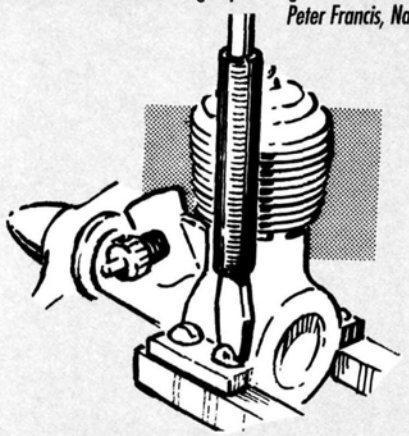
Roger Daily, Canton, IL



WING-TIP SCUFF PROTECTION

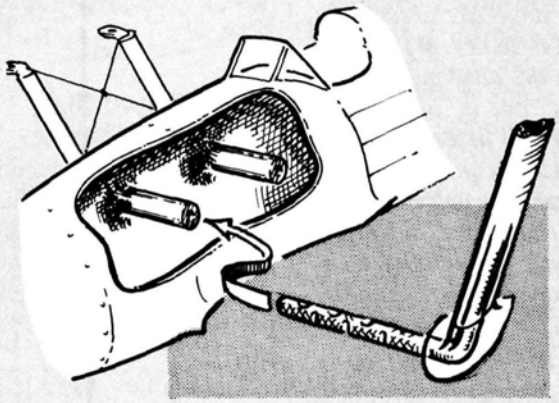
Make 1/16-inch slots in the wing tips, then install these useful skids. The holes are there as guides for the glue or epoxy. Our contributor says his skids were copper, but I think he meant copper-clad, fiberglass, printed-circuit board. Formica would also be ood, and so would a section from a large nylon hinge.

Peter Francis, Nassau, Bahamas



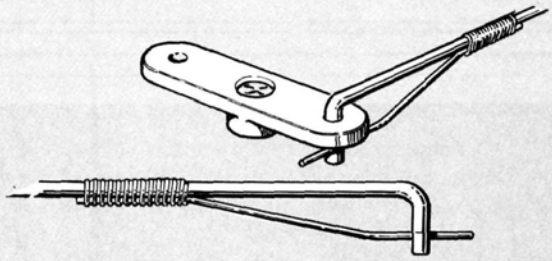
FIN PROTECTION

Put a rubber tube over the shank of your screwdriver to avoid damaging the cylinder fins if the screwdriver slips.



PAINTING TIP

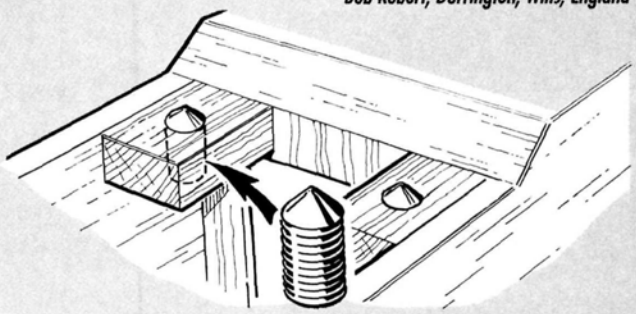
A 1/2-inch dowel (drilled and glassed solidly into a fiberglass fuselage and aligned with the cabane strut holes) allows you to paint the fuselage and struts separately. The strut ends are notched and roughened before being glued into dowels.



QUICK-RELEASE PUSHROD END

This is how we did it before we had nylon clevises. It's an oldie but goodie! The latch is made of 20-gauge music wire that has been bound and soldered. This is very useful in confined spaces and will never foul the servo-arm center at extremes of deflection. This British contributor's club logo is a picture of Stonehenge. His club? The Flying Druids, of course!

Bob Robert, Durrington, Wilts, England

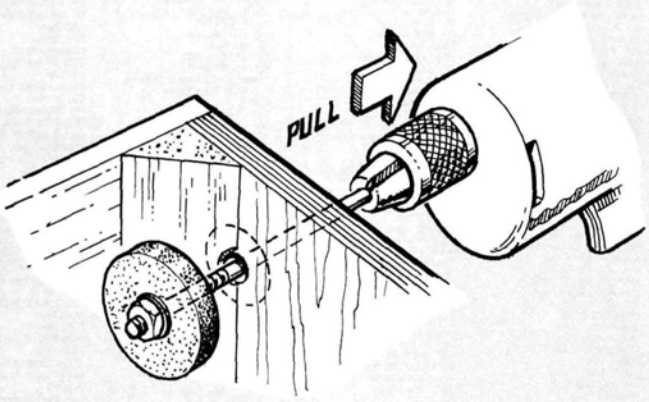


LOCATING WING-BOLT CENTERS

If you already have blocks installed, drilled and tapped, this idea is invaluable. Cut the heads off a pair of machine screws, file points on their ends, insert them into the blocks as shown, then fit the wing (aligning it properly). Carefully but firmly press down on the wing, and when you remove it, you'll find two neat dimples that are ready to accept a drill point. You could also put paint or ink on the screw points so that the marks show up even more clearly.

Charles H. Brown, Jackson, MS

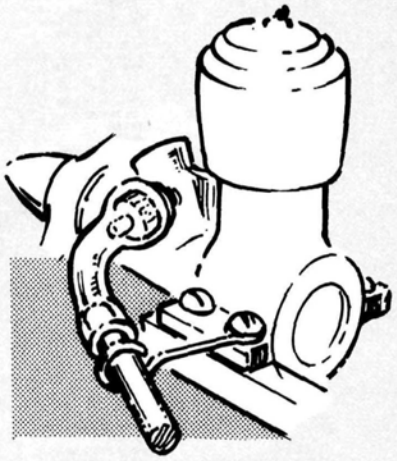
(Continued on page 14)



BLIND ROUTING

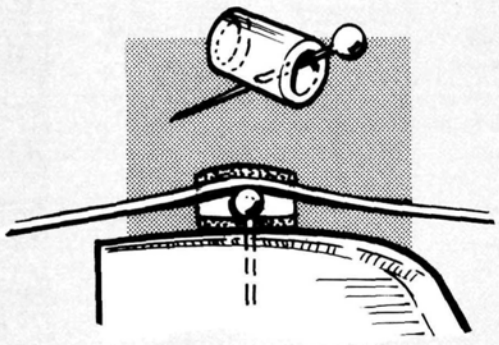
Ralph decided to install the new anti-vibration mounts on an existing fuselage, but he found that the large, balsa-wood reinforcing triangles interfered with the 1/4-20 T-nuts. To make enough clearance, he inserted a long mandrel (probably a threaded rod) through the firewall from the front, attached a small grinding wheel, switched on, then pulled steadily forward on the drill to grind away the necessary clearance.

Ralph J. Leidner, Coral Gables, FL



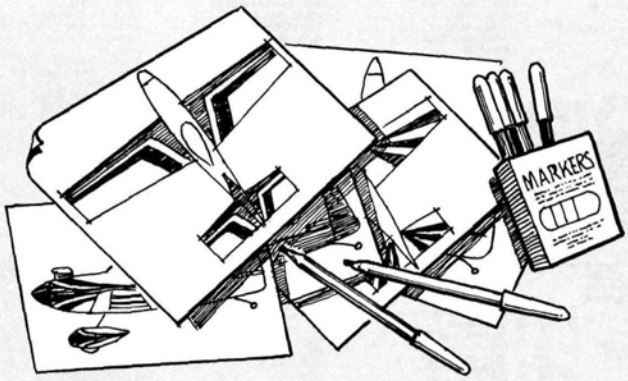
NEEDLE-VALVE DRIVE

Try this angled, flexible drive for your needle valve. Force-fit a length of rubber fuel line over needle, then use CA to glue a dowel into the other end of the tube. A simple wire bracket made out of a paper clip holds the needle at the angle required to keep knuckles away from the propeller.



ATTACHING ANTENNAS

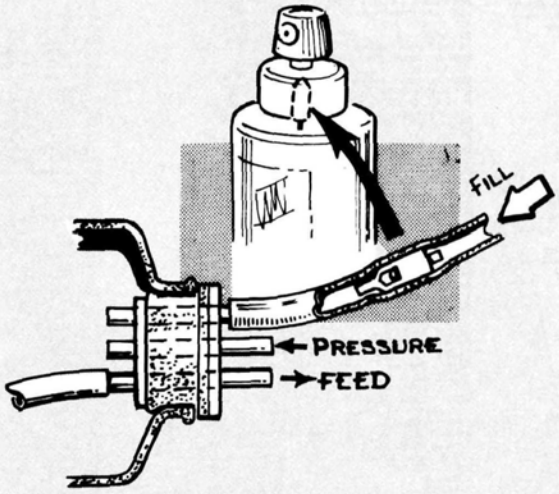
Here's a very neat antenna attachment: push a glass-headed pin into a short length of rubber tube, then epoxy it into the fin tip. Feed the antenna through the tube for a friction fit, which keeps the wire taught without using an unsightly rubber band.



COLOR-SCHEME PLANNING

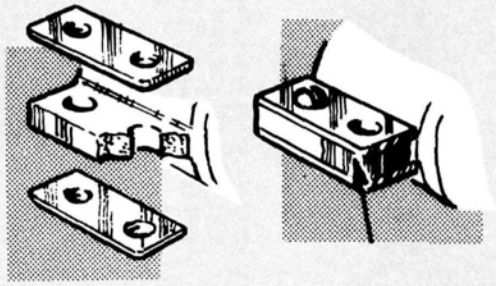
Make a small, scale drawing of your latest project. Draw side, top and bottom views; then make several photocopies. Before you use any paint or cut film, map out your color scheme on these copies.

John Breitenbach, Silver Bay, NY



TANK SHUTOFF

Take a one-way valve from the pump on a spray jar, then force it into the filling line of a pressure fuel system. It makes an automatic shutoff when the tank pressurizes.



LUG REPAIR

A broken engine lug can be repaired by bolting two 1/32-inch steel plates above and below. Fill the space with solder or metal-filled epoxy putty (which should be filed down flush), then drill out the mounting hole. To avoid stressing the lugs when the engine is next bolted down, remember to epoxy a 1/32-inch steel shim under the opposite lug.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

$END IN YOUR SNAPSHOT$!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1990. The winner will be chosen from all entries published, so get a photo or two together plus a brief description and send it in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

FINE-FLYING FOKKER

This Fokker D-VII was built by Fred Schill (Owensboro, KY) from *MAN* plan no. 4852, and Fred has been flying it for two of the nine years during which he's been involved with R/C (and reading *MAN*). Fred chose an O.S. .61 4-stroke for power and says that the D-VII flew "right off the board" (not while he was working on it, we hope!). Beautiful flight shot, Fred.

JOINT PROJECT LIBERATOR

Dennis O'Connor Sr. (Thousand Oaks, CA) started on his Stafford-kit-based B-24 about six years ago, but, as many of us do, he stored it in his attic while he attended to other things. About six months ago, after some prodding from his son, Dennis Jr., it was out of the attic and back on the building board. The results are shown here. The B-24 weighs 10½ pounds, is powered by four O.S. .15s and finished with automotive acrylic. Sure looks like the real thing, doesn't it?

WEST COAST OSCAR DEUCE

Charles Waldron (Fremont, CA) started with the Royal Cessna Skymaster kit, was inspired while walking through the Castle Air Force Base Museum, and this very pretty O-2 is the result. (It's a replica of the full-scale version on display at the museum.) A pair of O.S. .48 Surpass engines supplies the power, and Charles reports that the plane "flies great" at its 12-pound weight. Takeoffs and landing are easy—especially off the newly finished artificial turf runways at Charles's club field. Looks great to us!

DAVE'S DELIGHTFUL DORA

This 20-pound, 80-inch-span Focke Wulf FW-190D was built by Dave Nault (Austin, TX) from the Bob Holman kit. It's equipped with Platt retracts, flaps and a Webra Bully glow engine. Powered by a World Expert radio, the big Dora is a pleasure to fly and as easy to land as a Kaos. (With its typical, FW, wide-track gear, that doesn't surprise us a bit, Dave; and it's a lot prettier than most of the Kaos we've seen.)

.20-SIZE PYLON POLISHER

Silverblade is Carlos F. Reyes' (Niceville, FL) Club 20 racer. Designed by fellow Eglin Aeromodelers member Bill Clements, the 42-inch-span model uses a built-up fuselage and foam wing core. Carlos used K&B SuperPoxy on the fuselage and tail feathers and MonoKote on the wing. A K&B .20 Sportster supplies the power, and Carlos describes performance as "aerobatic and fast!" Nice job! Just remember to keep that checkerboard tip up when rounding the pylon!

GOLDEN AGE EAA BIPE?

One of the nice things about biplanes is their ability to wear a great variety of finishes—all attractive. That was apparently the opinion of Keith Bryant (Sunbury, OH) when he built his Balsa USA EAA Bipe. He chose a scheme that's reminiscent of the one worn by many fighters of the '30s. He used Cheveron Perfect paints over the Sig Coverall, and these nicely duplicate the "rag-covered" effect. Power comes from an Enya .90 4-stroke swinging a 14x7 prop. Keith says the bipe has more than 40 flights on it; each time, it flew as though on rails.

GORGEOUS GOONEY BIRD

Garry L. Kravit (Plantation, FL) is a UAL 727 flight officer, so it's only natural that he chose that carrier's livery for his DC-3, which he built from the Royal kit. Powered by a pair of O.S. .32s and weighing 9¾ pounds, the DC-3 is covered with chrome MonoKote that was sprayed with flat polyurethane to soften its shine. A Futaba 7-channel system handles the control chores, and although Garry's 3-year-old son Kai hasn't yet checked out on the Gooney Bird, he *is* learning to fly R/C.

ASTRO HOG RG

The blue-and-yellow Air Corps scheme of the '30s surfaces again this month—this time, on an Astro Hog built by Ron Gagner (North Oxford, MA). Ron didn't say whether the Hog was built from scratch, the old Berkeley kit, or the "new" Sig kit, but it doesn't look as though it has been "around for many years," as he says. The powerplant is certainly current—an HB .60 with a tuned pipe. Other "modern" niceties?—90-degree rotating retracts from Rhom. Ron apparently enjoys flying; he burned 32 *gallons* of fuel in 1989! I wonder how many miles that converts to?

HOW TO:

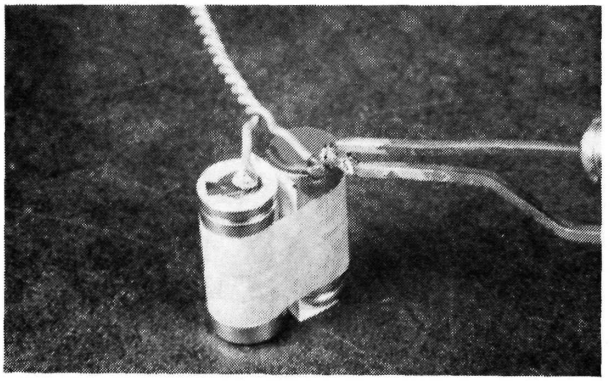
by RANDY RANDOLPH

MAKE A LIGHT FLIGHT PACK

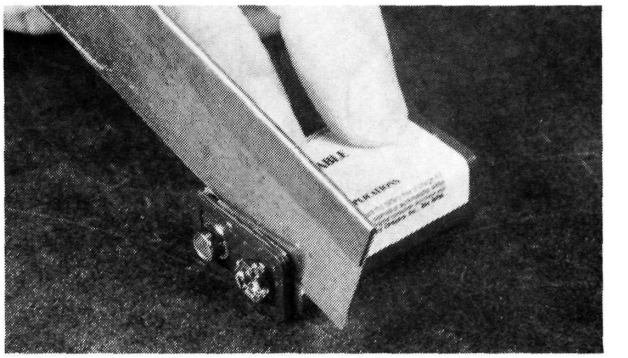
Rechargeable "transistor" batteries are almost universally available, and two of them will provide two or three very light flight packs. Each pack provides a safe, 15- to 20-minute flight and can be recharged with a standard, 4.8V, 50mA charger in about 4 hours. The photos show the way.

1. *Rechargeable "transistor" batteries are really 7.2V batteries in a 9V package. Only batteries with little white dots on the bottom should be used.*

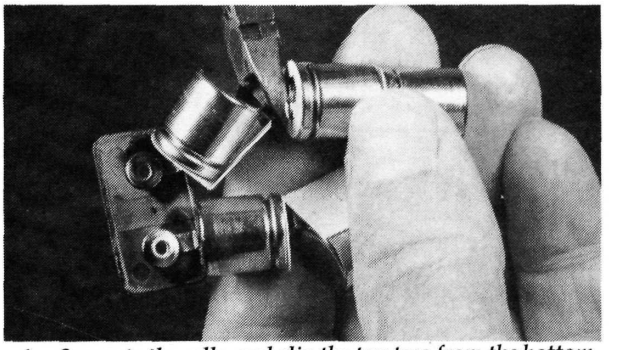
3. *Slip the cells out of the case. You'll find six 50mAh cells connected in series with plastic insulators between them.*



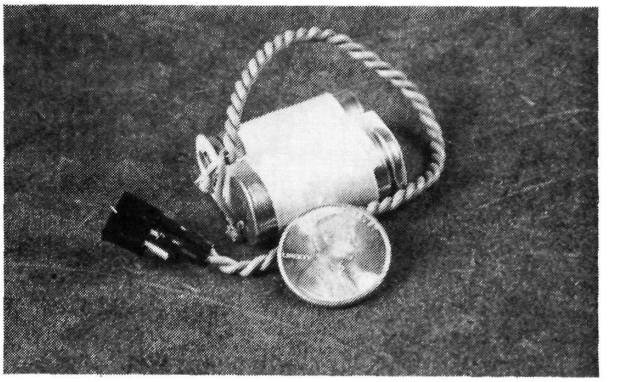
5. *To hold them together, wrap the four bottom cells with masking tape and solder wire leads to the two terminals. The tabs will take solder and keep the heat away from the cells.*



2. *Use a razor or a hacksaw to cut through the case just below the connectors. Turn the case as you cut so the saw cuts only the plastic case and not the internal connections (or you could short the cells).*



4. *Separate the cells, and clip the top two from the bottom four. Cut them so that there's some metal ribbon left on each to act as solder tabs. The bottom four will form the flight pack; the top two can be combined with the top two cells from another battery to make one more flight pack.*



6. *A connector finishes the assembly; the completed packs weigh a little more than 1/2 ounce. (Thanks to Tom Anderson, who flies CO2 R/C, for this idea.)*

AIRWAVES

There are too many model publications, and I can't afford them all. *MAN* is last with respect to my interests. I'm an old-timer: 53 years old and a modeler for 41 years. *MAN* seems to be oriented primarily toward beginners and the "buy-and-fly" ARF types. I'm a scratch-builder, and I hardly ever use kits.

I was appalled by the lack of construction articles in *MAN*. There's usually only one per issue, and most of these articles are silly, little, low-tech or beginner projects (e.g., the March '90 "Chips" article). When was the last time you ran a high-tech pattern plane or a Formula I racer? Certain topics are over-emphasized, e.g., jet fly-in reports. I recognize the editor's pet bias, but this is too much.

I was a loyal subscriber to *MAN* for 30 years (1947-1977), and I'll give you credit, because it's better now, but it's not for me anymore.

BILL UNDERKOFLER
Vestal, NY

I'm sorry you feel that way, Bill, but I do appreciate your candor. What really concerns me is that you consider yourself an old-timer at 53. I'm less than a decade away from that point!

Our editorial policy is built on what our valued readers have requested, and we do try to create a well-rounded package. We offer many ARFs, because they're popular and can't be ignored. Some people kick and scream about how ARFs are destroying the hobby. Rubbish! The hobby is dual-tracked—it involves both building and flying. Many excellent fliers, who couldn't care less about building a model, got into R/C by way of the ARF. The market for ARFs continues to grow, and most of them are imported. You'll never convince me that it takes any longer to design and market an ARF than it does a kit. So why are new ARFs being introduced almost weekly? Simple: the manufacturers recognize a market, and they go after it. If it's not there, they create it. Sadly, domestic kit manufacturers don't seem to be willing (or able) to do the same. The modeling public is fickle, and I understand the reluctance of a kit manufacturer to produce something that modelers examine carefully but won't buy; instead, they buy the import.

Bill, if you accept the fact that 70 percent (at least) of the modelers in the U.S. can be categorized as "sport" types, you can understand why we haven't presented any "hi-tech" pattern or Formula I planes lately. Who would build them from plans? Most of these machines are highly specialized with glass fuselages and foam-cores, and they're operated by some very proficient fliers. Scratch-builders would probably look on the design with disdain anyway, because they wouldn't be able to build it from balsa and ply.

Is "lo-tech" the label you'd apply to our construction articles on the D.H. Beaver, Dave Ramsey's DC-3, Doc Keith's SB2U-1 Vindicator or Paul Willenborg's ½A Fantrainer? Most of our readers wouldn't! I appreciate your comments, and I hope that you'll reconsider MAN in the future.

RAU

Reverse "Name That Plane"

Here's one for you. I picked this up in Switzerland in 1962, and I've never been able to identify it. It looks like a Messerschmitt/Stuka with a little Ercoupe thrown in. What is it?

I've got the original, if you'd like to feature it in "Name That Plane."

CARL CROSBY
Sandy, VT

C'mon, Carl; sure we know what it is. We've been doing "Name that Plane" too long not to know (or at least not to be able to find out!) Here's what we're going to do: we'll send a complimentary subscription to the person who sends us the correct answer. The winner will be drawn from the correct answers received. RAU

Where is the Walrus? Koo-Koo-Ka-Chew

I've been looking for a plan or kit in which to use a 4-stroke radial engine in as near scale configuration as possible. The aircraft I remember was called a "Walrus," and all I know is that it's a British-type amphibian, open-cockpit, tractor-engine biplane—air/sea rescue (I think).

I'd appreciate any information you might have on plans, etc. Do you think this combination would make a successful R/C project? I've been away from model building for almost 40 years, but now I have the time to enjoy it again.

D. J. ASHER
c/o Sterling Jewelers
168 Queen St.
Dunville N1A 1H7
Ontario, Canada

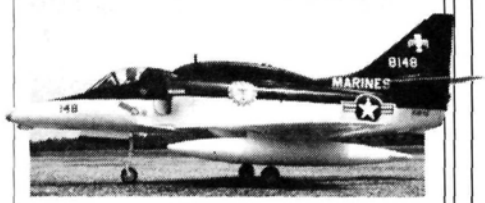
Mr. Asher, there's no doubt that the Supermarine Walrus would make a great R/C project. I don't know of any plans drawn to the size that would accept a 4-stroke radial, but it sure sounds exciting. Lyle Pepino (Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403) has photos, and he might have some scale drawings. Any readers able to help? RAU

Really Remote Control

I'm 15 years old, and I've nearly completed a Sig Clipped Wing Cub. I'd like to give you an update on it. First, I should mention that the nearest hobby shop is over 400 miles away, and I've ordered my accessories from as far away as California. The instructions were easy to follow, and when a problem occurred, the columns in your magazine proved useful. I used MonoKote to cover my model and, apart from a few wrinkles, it looks great. Thanks to *MAN* for all the useful information.

MELVIN HIBBS
Newfoundland, Canada

Melvin, your letter brings new meaning to the term "youthful perseverance," and we salute you. How about sending us some pictures of your Cub for our "Pilot Projects" section? RAU



Squadron Markings Source?

I'm in the process of finishing a Byron A-4 Skyhawk kit, and I'm having a problem getting information on the paint scheme I want to use. I recall reading a "Field & Bench" report on the A-4. The plane was black and white with a checkered mirror-like paint, and it had Marine markings. I'd really appreciate some information on the scale

(Continued on page 22)

AIRWAVES

(Continued from page 21)

painting of my model. I'd also like to find out where I can get the squadron emblem stickers shown on the side of the plane. Were they custom-made, or does someone manufacture them?

Keep up the good work, especially with the "Jet Blast" column. I also have an F-20 Byron on the shelf. Any word on how that plane performs?

GEORGE CASTELLANOS
Montclair, CA

George, I'm pleased that you enjoyed that presentation in the October '83 issue; unfortunately, it's no longer available. I did that "Field & Bench" long before I occupied this seat at MAN, and you might be pleased to know that the A-4 is still around. The unit badge (NATC Pax River) was made by photographing an original marking, sizing it to fit on the A-4 and producing color prints from which most of the paper backing was removed. This "thin" picture was then attached to the model and sprayed with multiple coats of clear epoxy. This is a long way around the horn, but there's no way it could have been accurately hand-painted. Some companies now produce customized special markings for scale R/C models. The process is expensive, especially since it's one-off custom work, but the results are incredibly accurate. One source is Aeroloft Designs, 8716 S. Roberts Rd., Hickory Hills, IL 60457. Contact them for additional information.

RAU

Tomcat Tweaker Seeking Small

I enjoy reading your articles on ducted-fan models, but I have one gripe. I constantly see pictures of F-14 Tomcats, but I never see pictures of this remarkable aircraft in flight. I'm considering starting an F-14 project, and I hope *MAN* will review the plane. My only problem is that I can't afford a model the size of the Yellow Aircraft kit, and I'd like to know if a .25- to .40-size kit is projected for the future. I'm an F-14 plane captain at the Grumman Calverton plant, and I'm eager to complete and fly a scaled-down version. Do you have any suggestions?

TIM LENT
Shoreham, NY

Hey, Tim, did you start reading MAN last month? We had in-flight shots of Dennis Crook's Yellow Aircraft F-14 in MAN ages ago. It seems we have the same problem as you; we can't afford the kit for a review, either! It's a beautifully designed airplane, and Dennis flies it well, but it's not really a "sport flier." It's rather sophisticated, and it even requires a specialized radio for successful operation. Because of the complicated wing-sweep mechanics, it's also about as small as it can get. There's no reason why a smaller version with fixed-geometry wings wouldn't work. Sneak off the flight line and get up to one of the drawing boards in engineering! You make it work, and we'll publish it!

RAU

T-Bolt Two Plans

In your April '90 issue, there's a picture of an A-10 Thunderbolt II by Ed Couch. Are there any plans available for scratch-building it?

ROBERT E. TATE
Kansas City, MO

Bob, Ed bought a set of A-10 plans from Mike Beaulieu's Plans Service that were originally designed by George Miller. I haven't seen anything from Mike's Plan Service recently, but slightly smaller A-10 plans are available from Scale Plans and Photo Service (3209 Madison

Ave., Greensboro, NC 27403) and Hobby Barn (P.O. Box 17856, Tuscon, AZ 85731). RAU

Where There's Smoke...

I'm 15 years old, and my Dad and I have been building R/C models for about 5 years. Could you send me the names and addresses of companies that manufacture smoke systems for model aircraft. I'd really appreciate your help.

JONATHAN EPP
Canada

There are a lot of them, Jonathan, but here are some addresses that might help: Slimline Mfg., P.O. Box 3295, Scottsdale, AZ 85257; J-Tec, 164 School St., Daly City, CA 94014; B&B Specialties, 14234 Cleveland Rd., Granger, IN 46530. RAU

BUF Builder

I'm attempting to construct an R/C model of the Boeing B-52D Stratofortress, and I need a set of three-view pictures or drawings. I also need design specs for this Boeing monster. Do you know the address of Boeing's main office, so I can get more information? I've contacted Jet Model Products about its ducted fans and recommendations on the engines. I'd appreciate any help or information you can give me.

STACY J. MAUST
Enoch, VT

Stacy, I've got to tell you, you're the kind of customer that Jet Model Products (and any other manufacturer) must love. Eight engines, eight fans, eight pipes, a forest's worth of balsa, and more foam than at a picnic-cooler manufacturers' convention—not to mention any of the "smaller" stuff! I think a letter to the Public Relations Department, Boeing Military Aircraft Division, Wichita, KS, might get the ball rolling. Keep us advised! RAU

On The Right TRAINer Track

I'm 12 years old, and I haven't had much experience with model airplanes because I've been a model railroad enthusiast. Can you help me pick a good plane and give me some tips on how to begin. A Carl Goldberg Models Piper Cub is what I had in mind.

ALEX MAST
Haven, KS

Alex, while the CGM Cub is a great airplane (see Melvin Hibbs' letter), building it might be a little difficult for you. There are some excellent first airplanes out there: CGM's Freedom 20, which we reviewed in the June issue, and the Eagle/Eaglet series. Midwest offers the AeroStar in two sizes also. These designs are geared to the beginner, and they contain excellent building instructions. Save the more scale-like airplanes for later when you've gained some experience. Welcome aboard! RAU

You're Very Welcome

I'm 17 years old, and I've just made a smart investment. This month, I had a little pocket change, so I bought my first *Model Airplane News*. I'm in the process of scratch-building a Cheetah 2X. It's two times the original 1/2A Cheetah, and it has room for a .90 and retracts. The Cheetah is a high-performance, high-speed pattern airplane, and I'd like to use it in competitions. When I enlarged the plane, I had to change some things. I found an article about airfoils in your magazine, which helped me a lot. Thank you for providing a magazine full of informa-

(Continued on page 24)

AIRWAVES

(Continued from page 23)

tion, instead of just advertisements.

Eric Henke
Rose Hills, KS

Eric, we think you made a smart investment, too. If your 2X Cheetah works out, tell us more about it and maybe we can share it with other MAN readers. Bill Underkofler might even be interested in it if it's "hi-tech." There's nothing wrong with advertisements; it's just that we prefer to present information—and we're getting better at it. RAU

Heli Hopeful

I'm interested in R/C helicopters, and I need some advice on choosing a machine. I'm an unemployed 14-year-old with a limited cash flow. If I learned to fly a fixed-pitch heli and then bought a collective one, would I have to re-learn some of my skills? What's involved in flying a collective heli (e.g., the Hirobo Shuttle or Concept 30) with a 4-channel radio? How would a collective-pitch heli perform with a mechanical mixer compared with one with a heli radio or a fixed-pitch heli?

There was some information on a mechanical mixer made for helis; it has a sliding swashplate or a multi-blade system. Would this work with a shuttle, Concept 30, or X-Cell 30? Is the X-Cell 30 a good first heli? Would a Rebel really fly with an airplane engine, such as a K&B .40? Any information would be greatly appreciated.

Gib Lichstein
Colorado Springs, CO

Gib, first of all, why aren't you working? Forget being a kid—get out and get a job! How can you ever expect to improve your cash position with no cash? I suggest that you buy Kyosho stock on margin, enhance your liquidity and avoid pork futures. Seriously, you won't be "re-learning" your heli flying skills when you go from a fixed-pitch to a collective machine, but you'll appreciate the differences in response and handling.

I wouldn't recommend flying any collective-pitch-equipped heli with a 4-channel radio. Five-channel radios designed for helis are now attractively priced, and their features make learning to fly much easier. Forget about mechanical mixing—it would be difficult to make it work effectively, and I doubt that you'd be happy with the results. Multi-blade heads have been used, but the jury is still out on just how worthwhile they really are. Since nearly all the current helicopters (including the top-of-the-line competition machines) still use two-blade systems, I suggest that you stay with them. We haven't reviewed the X-Cell 30 from Miniature Aircraft, but there's no reason to believe that it wouldn't be good. Have any readers had experience with it?

The GMP Rebel is marketed as a heli that lets the newcomer use his standard, fixed-wing radio and a sport .40 engine to get into R/C helicopters. Dick Tristao reviewed the Rebel in our March '90 issue, and he thought it was a fine beginner's machine. He concluded that his was overpowered when fitted with a Fox .50 engine, but that might be a good choice for those who live at higher altitudes (like you, Gib). For other locations closer to sea level, a .40 should work just fine. Hope this helps! RAU

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

SMALL STEPS

Stability Factors in Our Models

by JOE WAGNER

WHEN A sudden gust disturbs the flight path of a model airplane, an important quality comes into action—"inherent stability." This stability is an aircraft's tendency to resume its original attitude and air speed automatically. Several factors interact to produce this effect:

- balance point (center of gravity, or CG)
- angular settings of the flying surfaces (decalage and dihedral)
- wings and tail areas
- weight
- and lengths (moment arms).

For small, low-powered R/C models, inherent stability is particularly good. An R/C pilot is more confident when he knows that if he lets go of his transmitter sticks, his airplane will still fly nicely under its own control. Too much stability, however, can be as bad as too little. An excessively stable R/C model fights its control inputs and has to be flown more by brute force than by finesse. R/C models need just enough inherent stability to fly without having to be "piloted" every second, yet they should also respond quickly and smoothly to control-surface deflections.

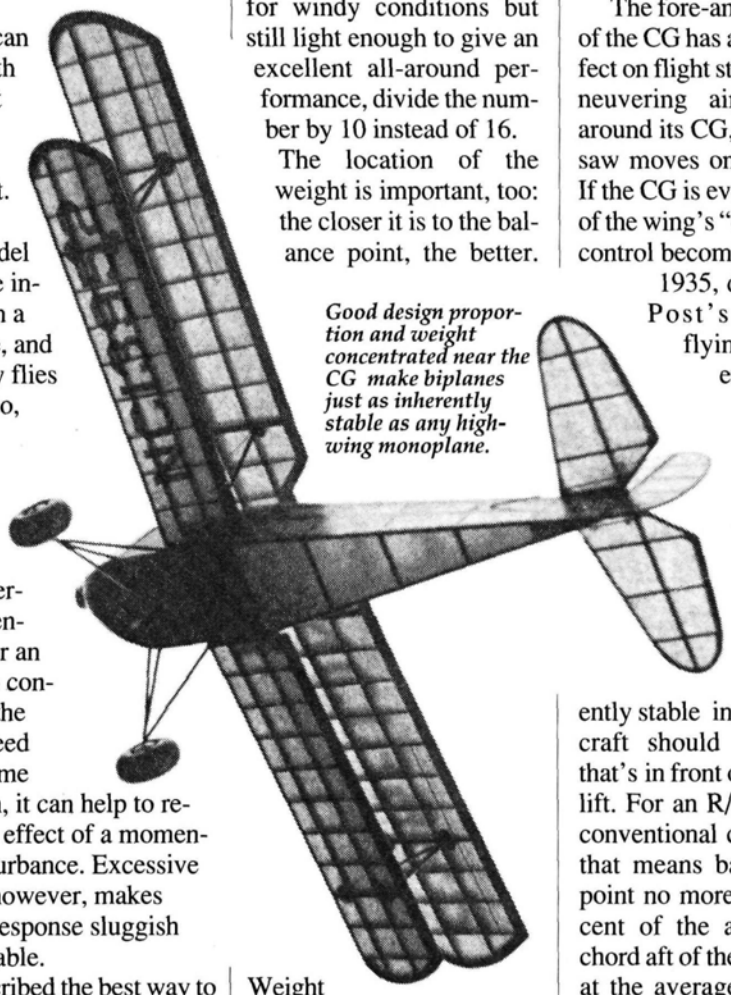
FINDING THE IDEAL WEIGHT

If you made your model from a kit or a published plan design, its major area and angular relationships have been predetermined. The only stability variables you can readily affect are weight, balance and accuracy of construction.

Weight can work both *for* flight stability and against it. A heavy R/C model has more inertia than a light one, and it usually flies faster, too, so increasing the inertial effect. Since inertia is a tendency for an object to continue at the same speed in the same direction, it can help to reduce the effect of a momentary disturbance. Excessive inertia, however, makes control response sluggish and variable.

I described the best way to establish the ideal weight for a small R/C model in this column a couple of years ago: the volumetric loading method. To re-state it briefly: multiply the model's wing area (square inches) by the maximum height of the airfoil above the line that joins the centers of the leading and trailing edges. Divide this value by 16 to find the lightest weight (in ounces) that you should aim for if your airplane is to be flown primarily in calm weather. To find the weight that's good for windy conditions but still light enough to give an excellent all-around performance, divide the number by 10 instead of 16.

The location of the weight is important, too: the closer it is to the balance point, the better.



Good design proportion and weight concentrated near the CG make biplanes just as inherently stable as any high-wing monoplane.

Weight far from the CG can adversely affect stability. For example: I have a long-span, foam-wing, sport R/C model whose left and right wing panels are of very different densities. To balance this wing laterally, I added a lead slug to the light tip. In level flight, this isn't a problem, but it's difficult to make smooth entries into (and out of) tight turns. Because the tip weight is so far from the model's CG, its inertia fights any sudden change of direction.

The fore-and-aft position of the CG has a profound effect on flight stability. A maneuvering aircraft pivots around its CG, just as a seesaw moves on its crossbar. If the CG is even slightly aft of the wing's "center of lift," control becomes erratic. (In 1935, despite Wiley Post's legendary flying skills and experience, he and Will Rogers were killed when their tail-heavy Lockheed seaplane crashed.)

To be inherently stable in flight, an aircraft should have a CG that's in front of its center of lift. For an R/C airplane of conventional configuration, that means balancing at a point no more than 30 percent of the average wing chord aft of the leading edge at the average chord. This applies to all types of monoplane wings: tapered, curved, or rectangular; swept or straight; even Deltas. (Biplanes are more complicated to figure.)

Although nose-heavy airplanes are better than tail-heavy ones, they have too much longitudinal stability,

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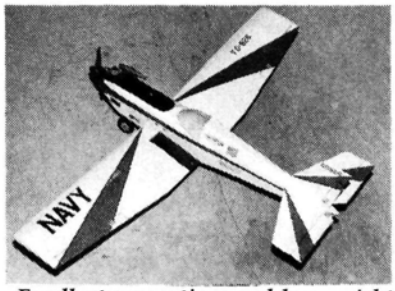
PHOTOS BY JOE WAGNER

SMALL STEPS



Excellent proportions and low weight (19 ounces) make Bill Cannon's tiny Griffin VI stable, yet fully aerobatic.

and this can cause phugoid oscillation: an alternating climb-and-dive tendency that's difficult to stop. In level flight, the tail of a nose-heavy plane must carry a download to balance its excessive nose weight. At a constant air speed, this works well, but if a gust causes a momentary dive, the airplane picks up speed and the downforce on the tail increases. This pulls the nose up; the model slows; then the excess weight up front hauls the nose down again as the tail download diminishes because of reduced air speed.

The same thing happens in a properly balanced aircraft, but its oscillations are dampened rapidly because the effects of air drag are stronger than the effects of inertia. A very nose-heavy model's longitudinal oscillations worsen with each stall-and-dive cycle. Thus, for optimum stability, an R/C model's CG should be between 15 and 30 percent of the average chord, aft of the leading edge at the average chord.

Note the way I described the CG location! I've mentioned it twice for emphasis. For a wing with a rectangular planform, the root chord and the average chord are equal, and it doesn't matter where you check the balance point along the span. A non-rectangular wing, however, can be very different. For a tapered-wing model with a swept-back leading edge and a trailing edge that's at a right angle to the fuselage, balancing it at 25 percent of the root chord (aft of the leading edge) will give you an airplane that's more nose-heavy than it needs to be.

Hope this helps you to fly straight and true...till next time! ■

Rudder-only control required high stability on this 1960 1/2A R/C model. Short nose, long tail and lightness combined to make it a joy to fly.

LOOPER BLOOPER

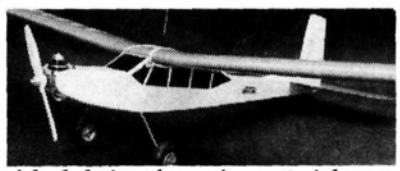
When R/C airplanes first became popular, an erroneous theory was widely known, and some modelers still believe it. Many say that a close-coupled (short tail-moment arm) model can loop more tightly than one with a longer tail moment—but they're wrong!

In fact, a model's looping radius is proportional to its speed and wing loading—and little else. Even the amount of elevator motion isn't particularly important: when elevators deflect past approximately 20 degrees, the control force they produce doesn't increase much. It might even *decrease:* any aerodynamic surface will stall if its angle of attack is too high.

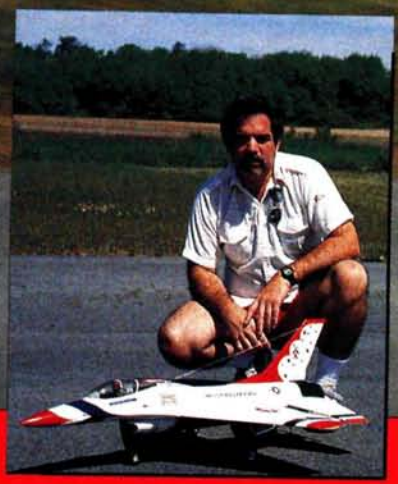
For my own R/C airplane design work—including modifications to kit models—I generally do the following:

- I put the stabilizer leading edge at approximately twice the wing's average chord aft of the wing's trailing edge.
- In small aircraft, I make the area of the stabilizer at least 20 percent of the wing area. (For *really* tiny ones, I'll go as high as 30 percent.)
- I like relatively short noses on my models, with the back of the prop about one wing chord ahead of the wing's leading edge.

All my R/C designs fly nicely "hands off," yet they respond promptly and precisely to control input. For schoolyard-type R/C flying, I think that's the only way to go!



A bad choice of covering material gave this Ace Whizard too much inertia (both lateral and longitudinal), and this made it difficult to fly.



SPORTS AVIATION

EZ F-16

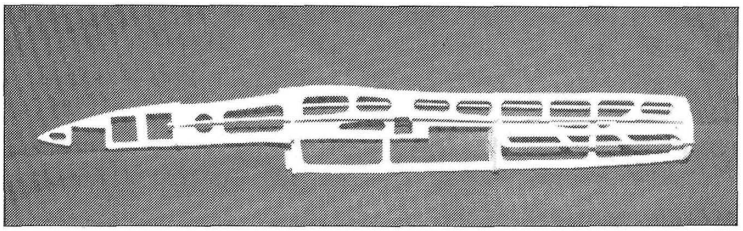
"For the experienced modeler." If you qualify, step up to the challenge!

by RICH URAVITCH

THERE'S A LITTLE line of type in the ad, right below the attention-getting shot of the new F-16, that reads, "For the experienced modeler." What do they mean by that? After putting together and flying this little gem, I'll tell you: this recent addition to Sports Aviation's ever-expanding EZ line is for modelers who are experienced in both building and flying.*

If you're a sport flier who's comfortable with a low-wing, aileron sport ship that will do a reasonable approximation of all the maneuvers you try, the F-16 probably isn't for you, because it isn't that type of plane. Likewise, if you enjoy carving, sanding and finishing balsa. Even if you have experience with other EZs, you're in for some surprises!

EZ F-16



The F-16's lite-ply crutch or "skeleton." This plane is quite different from other EZs; it's not as much of an ARF.

THE KIT

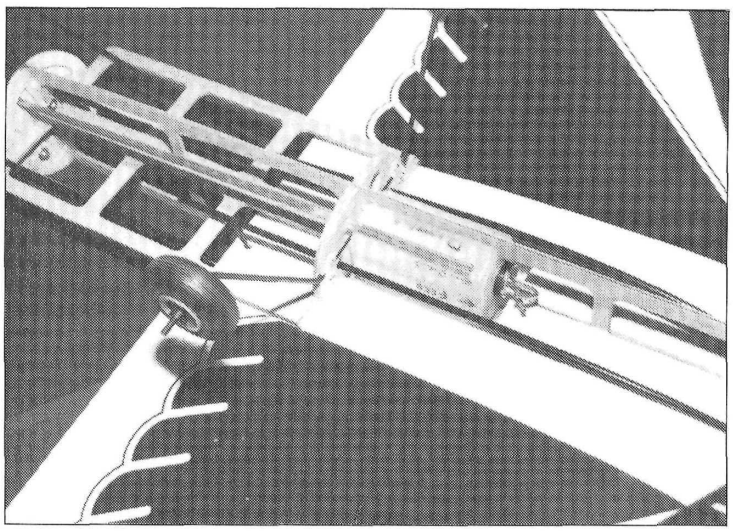
Inside the box, you'll see a layout of seemingly finished sub-assemblies not unlike other ARFs you've seen. The wings, vertical fin and horizontal stabilizers are finished in the typical EZ film-over-foam-over-balsa structure. The movable surfaces are even hinged.

Let's look at the fuselage. First, remove some of the pesky tape that's holding the parts together. Uh oh...all those parts just fell to the bench, and you're left holding a lite-ply crutch assembly that has the outline of an F-16 and a lot of holes! Better look at the assembly manual, which the EZ folks accurately call a "construction guide." It contains over 120 photos and illustrations to explain the assembly sequence clearly.

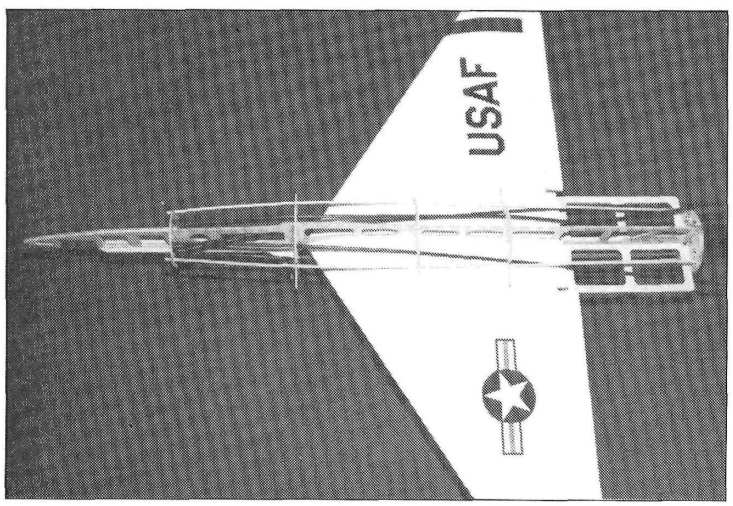
The nose gear, main gear and tail skid are attached first, followed by the engine mount. (They call it a motor mount, so write to them to explain the difference between a motor and an engine!). You'll go through the first 24 photos without using any glue!

Prepare the wing panels to be permanently attached to the fuselage. The instructions are fairly clear, but no mention is made, or marking provided, to ensure that the wing is installed at the correct incidence, and there's room for a wide variation. The easiest way to get it right is to epoxy the left wing panel into place and (before the epoxy cures) to slide in the vacu-formed forward fuselage piece until it fits properly. This forms an alignment fixture (of sorts) for the wing panel. After the epoxy has set, remove the formed piece, install the right wing panel and align it with the left one.

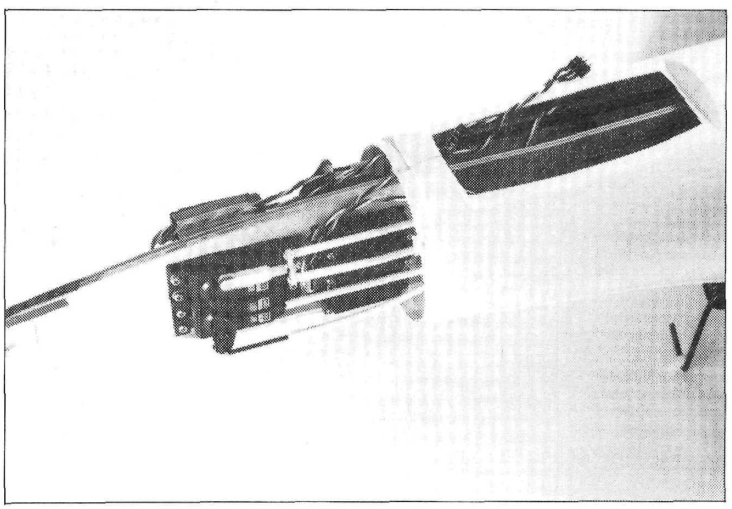
Assemble the supplied



Left: Fuel tank is positioned below the wing in the crutch. Aluminum "hard" lines carry fuel and muffler pressure, and they're connected to the tank lines with conventional silicone fuel tubing.

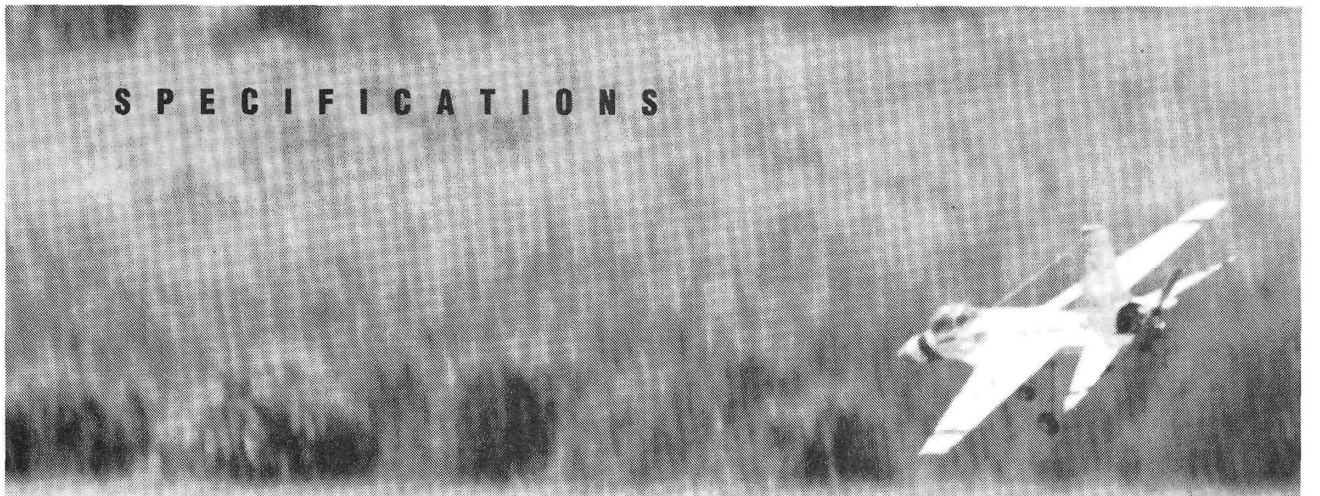


The wing panels have been attached to the crutch, and all the pushrod conduits properly routed.



Close-up of the servo installation in the nose with the "radome" removed—tight but well thought-out. Dark strips at extreme left are carbon fiber applied for strength.

SPECIFICATIONS



Type: *ARF sport scale*
Wingspan: *40 inches*
Weight: *64 ounces*
Wing area: *365 square inches*
Wing Loading: *25 ounces per square foot*
Power Req'd: *.25 to .28 2-stroke*
No. of Channels Req'd: *4*

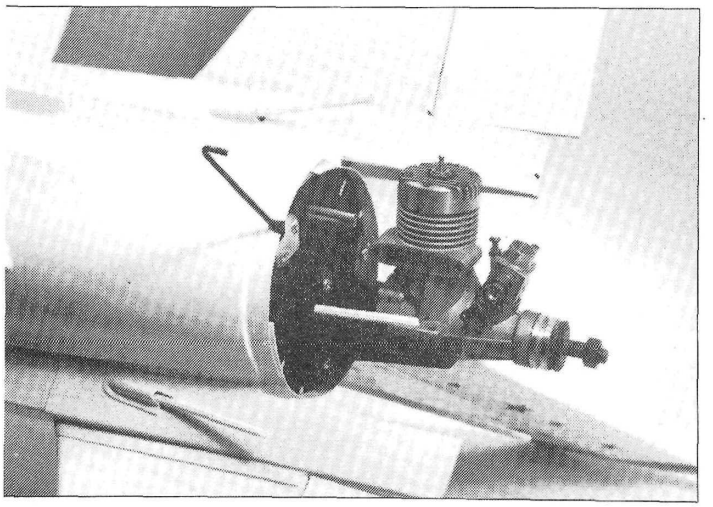
Sug. Retail: *$300*
Features: *Assembled lite-ply keel structure; vacu-formed plastic fuselage parts; finished wing and tail components; and a complete hardware package that includes fuel tank, motor mount and pusher propeller.*

Comments: *This sporty little airplane isn't a typical ARF (as the buyer must perform some assembly that isn't usually required), and it takes more skill to fly than the average sport model of this size. We agree with the distributor: the F-16 is for experienced modelers.*

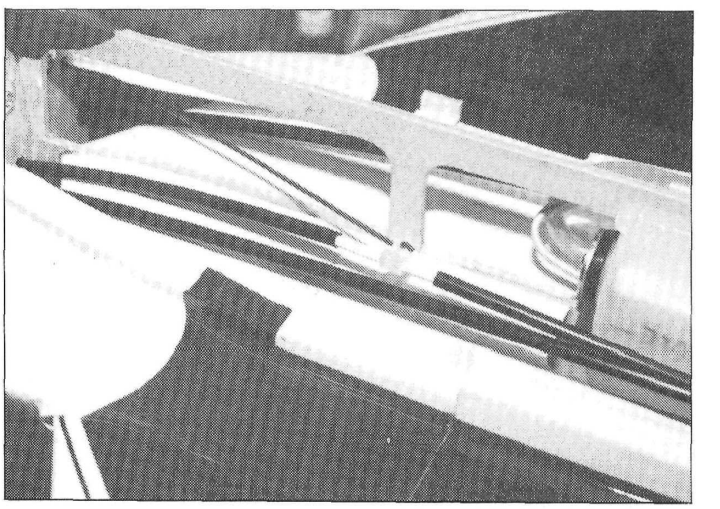
fuel tank according to the instructions, and install it midships, right below the wing. Fuel to the carburetor and pressure from the muffler are carried through long aluminum tubes that run approximately a third of the length of the fuselage. To dampen vibration and insulate them from each other, I bonded these "hard lines" to the bulkheads with silicone. If you plan to fly your F-16 with the "exhaust nozzle" (cowling) installed, consider using a three-line fuel system because it's difficult to reach the fuel line at the carburetor for refueling. If you opt for the third line, it must be installed now, because you won't be able to modify the tank easily later.

Install the pushrod conduits next. Caution: they must be installed and routed exactly as shown, because there's no vari-

(Continued on page 63)



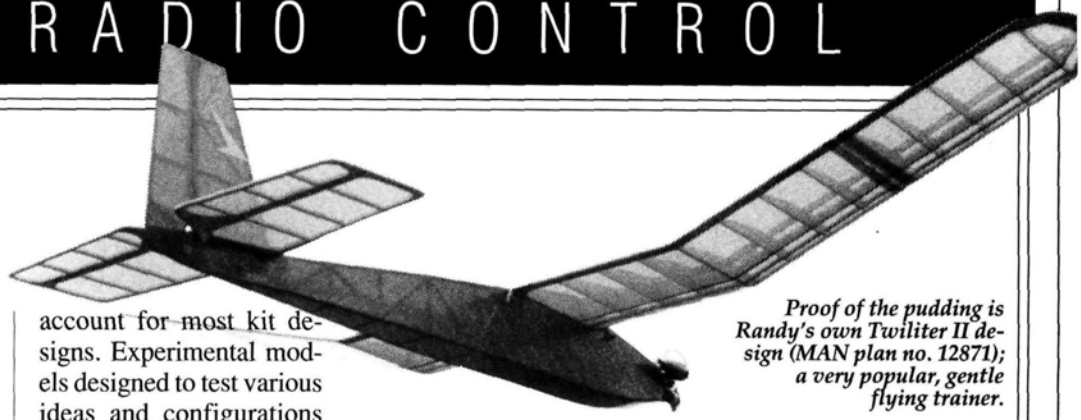
Installation of O.S. .28FSR. Note wire tail skid that protects pusher prop during takeoff and landing. Pushers are different!



Rudder pushrod is cut to allow insertion of a nylon fitting (arrow) that connects the pushrod (via music wire) to the nose-wheel steering arm.

BASICS OF

OF RADIO CONTROL



Proof of the pudding is Randy's own Twiliter II design (MAN plan no. 12871); a very popular, gentle flying trainer.

Proportions and Guidelines

by RANDY RANDOLPH

TO ESTABLISH the relationship between various parts of a new design, most modelers use the "what-looks-right" criterion. Some designers even do a few calculations to prove that "what looks right" actually *is* right. To a practiced eye, this is about all that's necessary to design an average, successful R/C airplane. The trick is to *develop* a practiced eye.

There are basically seven types of R/C airplanes. The first five—training, sport, racer, pattern and scale—are, by far, the most popular, and they account for most kit designs. Experimental models designed to test various ideas and configurations are the sixth type, and helicopters are the seventh. These last two types are birds of an entirely different feather.

The following parameters and relationships apply mostly to the first four types listed above. By definition, scale models must stay within the parameters of their prototypes. The principles outlined here can be applied, and they'll give an indication of the performance that can be expected from various scale projects as well as from some experimental types. Helicopters are excluded, for obvious reasons.

Even helicopters have their own "proportion" rules, but they're quite different from fixed-wing rules. Designs are generally based on intended purpose with "looks" being cosmetic.

As a general rule, wing loading (the weight that each square foot of wing must support) will give a very good indication of the performance that can be expected from an airplane. Likewise, total aircraft weight can dictate the power (engine) necessary to fly the airplane. Deciding on those two factors is the first step in designing a plane.

The following chart compares the types of performance you can expect, relative to the weight (in ounces) that each square foot of wing area will be supporting:

Type	Wing Loading
Gentle trainer	0-12 oz. p/sq. ft.
Easy-to-fly sport & trainer	13-19 oz. p/sq. ft.
Advanced sport & scale	20-25 oz. p/sq. ft.
High-perf. pattern & racing	26-34 oz. p/sq. ft.

Wing loadings that exceed these numbers usually apply to very large models or to those built for exhibition only. Remember; the larger the wing, the more weight per square foot it's able to support, i.e., a large wing with a 10-foot span and an area of 15 or 16 square feet could support almost twice as much weight per square foot as a wing with a 4-foot span and an area of 2 or 3 square feet.

Next, compare the total weight with the engine power. Think of engine power by comparing displacement in cubic inches. The following chart shows engine sizes and the total airplane weights. Each can be expected to fly well. It goes without saying that the lighter the airplane, the better it flies, so the minimum weight given is simply a guideline.

Suggested Engine Size	Airplane Weight
20 to 30 ounces	.049
28 to 38 ounces	.10
30 to 45 ounces	.15
40 to 50 ounces	.20
48 to 60 ounces	.25
5 to 6 pounds	.40
6 to 9 pounds	.60

By combining the wing

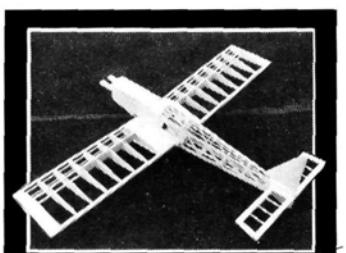
area in square feet with the wing loading for the type of performance desired, the airplane's total weight can be determined. Once the total weight is known, you can choose the right engine. Here are some more general rules that round out the basic airplane design parameters:

1. The ratio of the wingspan to the wing width (chord) should be between 5 and 6.
2. The wing's thickness should be between 12 and 14 percent of the chord.
3. The total length of the fuselage should be around 70 percent of the wingspan.
4. The nose-moment arm (distance from wing's leading edge to the back of propeller) should be about 15 percent of the span.
5. The tail-moment arm (trailing edge of the wing to leading edge of the stab average chord) should be about 25 percent of the span.
6. The stabilizer/elevator area should be about 20 percent of the wing area.
7. Elevator area should be about 20 percent of total stabilizer/elevator area.
8. The fin-rudder should be about 8 percent of the wing area.
9. Rudder area should be about 25 percent of the total fin/rudder area.
10. Strip ailerons should take up about 8 percent of the wing chord.
11. The airplane should balance at a point that's 25 percent aft of the leading edge at the average mean chord.

With this information, we can design an airplane. Let's assume that a .40-size engine is available and that the design is an easy-to-fly sport type. The chart tells us that a wing loading of 16 ounces per square foot is about right and that the engine would work well with an airplane that weighs 5 pounds. Therefore, the wing area should be 5 square feet.

A 5-foot wingspan (60 inches) and a 1-foot chord give the correct area, and it also falls into the acceptable range of a 5:1 ratio of span to width. A wing that size will fit into most small cars, so transportation shouldn't be a problem. If the wing is 1 1/2 inches thick at its highest point, that will satisfy rule 2.

Rule 3 says the fuselage should be about 42 inches long. Following the next rule, the nose arm should be 9 inches and the tail arm, 15 inches. Since the engine and mount will take up about 3 inches, the firewall will be located about 6 inches in front of the wing's leading edge. The wing will take 12 inches, and the tail group will occupy the remaining 6 inches.



A typical, low-wing trainer follows Randy's rules. Well-balanced layout and force arrangements ensure success.

Rule 6 states that the stab-elevator combination should be about 20 percent of the wing area, which, in this case, is 144 square inches, or 1 square foot. The fuselage length leaves 6 inches for the mean chord, and that gives us a span of 24 inches to arrive at the correct wing area. The elevator would be 20 percent of that area (rule 7), so the stab has a chord of 4 1/2 inches and the elevator, 1 1/2 inches. Since a square stab isn't very attractive, the root chord can be expanded and the tip tapered for a better appearance, while still retaining the same areas.

Following rule 8, the fin-rudder area would be about 60 square inches, and 15 of those square inches would be the rudder. Using the same mean chord as the stab-elevator, that would result in a vertical tail that stood 10 inches high with a 1 1/2-inch-wide rudder. The part of the fuselage below the stab is also considered part of the vertical tail, however, so the height would be reduced by that amount. Again, a larger root chord and a tapered tip would be more attractive and still retain the required area.

Jets (ducted-fan-powered) follow a lot of the guidelines, too. This F-16 weighs 11 pounds and is powered by an .81.

The airplane has a constant-chord wing, so the proper balance point would be 3 inches back from the leading edge. With this configuration, weight and power, the airplane would be a gentle, easy flying machine, and it would, therefore, satisfy the design parameters.

Not only that, but it also looks right. ■

SPORTY SCALE

TECHNIQUES

PHOTOS BY FRANK TIANO

by FRANK TIANO

Scratch-building; 4-stroke props; warbird racing; and other things

I'VE RECEIVED a number of letters asking how to scratch-build models without plans. At first, I thought, "How, in Stunning's name, will I ever answer that question in a couple of paragraphs?" After careful consideration, I've come up with the solution: first, choose a model that you're capable of building, and then decide if you have the time it takes to finish it. (Be honest when making these decisions). Second, you must absolutely love the subject matter to which you'll be married for the next six to nine months. Third, assemble all pertinent data, documentation, three-views and the other information *before* you start drawing the plans.

Charlie Nelson's Waco uses an O.S. 91 4-stroker and a 16x5 prop. Pete's Prop Chart says that Charlie should be using a 16x6 or a 15x6 to better utilize the engine's power. Being outside the power curve just means lost performance.

Bill McCallie's P-40 is a good study of panel lines, rivet detail, a sliding canopy and fillet work. The 80-inch model placed 11th at Top Gun '90.

The Boeing B-17 may be one of the prettiest aircraft of all time. This colorful version is mostly aluminum with patches of olive drab on the wings, rudder and elevators. The fin, stab, wing tips and cowlings are orange-yellow, and the two stripes adorning the rear fuselage are dark green.

Next, decide which over-the-counter accessories you'll need to keep this thing looking like your original design. In other words, don't design this airplane to use a 4.86 spinner when the closest stock size you can buy that resembles the shape of the prototype is only 4 inches. If your plane doesn't use a spinner, the same advice might apply to the wheel/tire size. Make sure that the wing is thick enough to accept the retracts you're using. There's nothing worse than seeing a pretty, new bird with 1/4-inch retracts protruding from the top wing skin! Yes, I know some build that way, but believe me, they're not doing it correctly. Once you've established your parameters, draw the airplane, cut out your parts and start building. The nice thing about scratchin' is that if you make a mistake in lofting a former or a rib, all you have to do is make a new one that fits. Canopies can be made by draping hot, clear plastic over a wooden form or by sending the form itself off to a vacu-molding company.

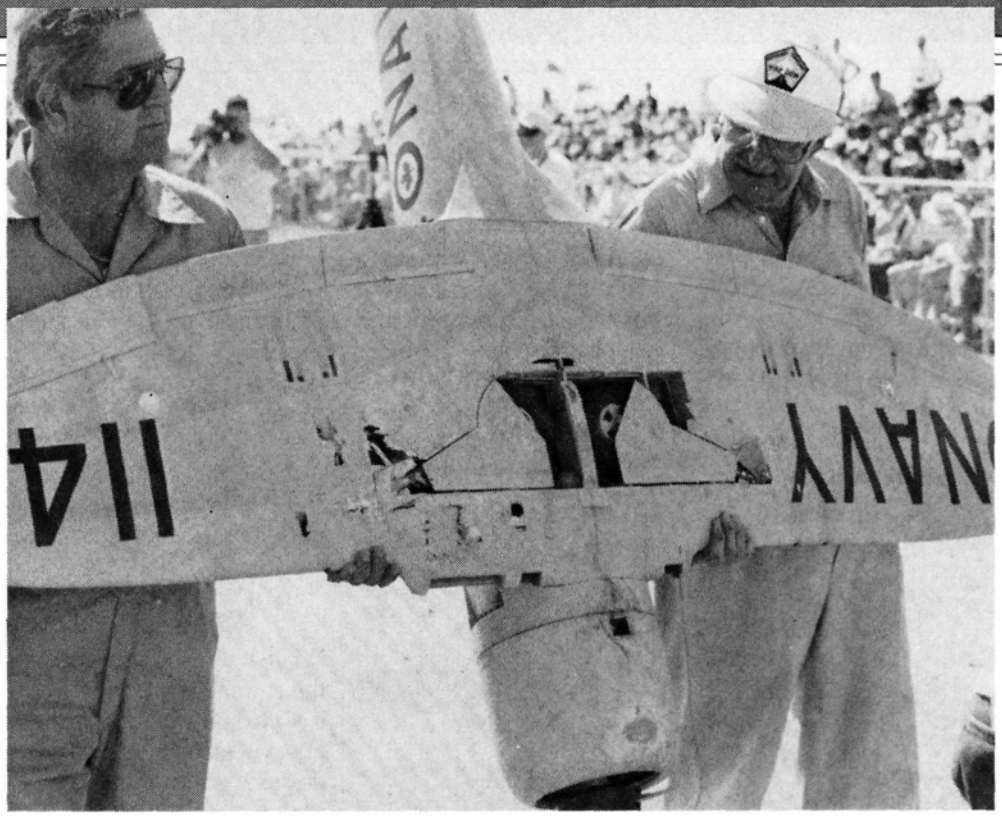
(Many companies will perform this service inexpensively.) Cowls are usually made from balsa and plywood, and they're constructed as miniature fuselages.

SCALE BUILDER'S ART

A few issues ago, I wrote about cockpit interiors and sliding canopies. This month, I have two examples that should interest you. Dr. Bill McCallie of Tampa, FL, owns a beautiful P-40 built from Jerry Bates plans, and I want newcomers to look over the canopy rails. Notice how the front windshield is faired into the forward fuselage. Next, take a peek at Wayne Siewert's award-winning Mooney. This interior is a fine example of how to do justice to a civilian aircraft! Yes, it does take a little practice.

30-SECOND CHANGE!!

The April issue of "Automotive News" carried the incredible story of the progress that Japan's Isuzu Motors has made with rechargeable batteries. To make a long story short, Isuzu has developed a wide range of high-powered batteries that range from a 1.2V unit the size of a coin up to a 12V automobile-size battery that can be recharged in *30 seconds!!* This is no joke; I'm absolutely serious. In fact, I've enclosed the article for Stunning to see. *[Editor's note: We're requesting additional details from Isuzu, and we hope to present the data in a future issue.]*



"The Professor" Don Smith (right) and Jim Manoli show exactly how durable Don's new Sea Fury is. The Smith/Tiano team had a combination landing-gear and engine-throttle problem at Top Gun—both at the same time. Frankie landed the big Fury on its belly at about 55mph and slid about 200 feet off the runway onto a gravel bed!

4-STROKE PROPS
—— (PETE'S PROP CHART) ——

AWHILE AGO, I promised some important data that will enable 4-stroke users to choose the proper propeller for their engines. Thanks to Pete Sepulveda, editor of the "F-Word"—the nation's most controversial, direct, honest and humorous newsletter—I now have this data.

The chart provided is self-explanatory. If you have a problem deciphering it, I suggest that you sell all your 4-stroke engines and take up the art of kit-bashing a Sterling rubber-band model! For those of us who aren't even *approaching* the rocket-science stage, Pete says we don't have to live with this "cc" stuff. That's right, cc's are for motor bikes; real men prefer cubic inches! If you remember that 1 cu. in. = 16.3934 cc (.061 cu. in. = 1cc), you'll be all set to attack that shiny, new solar-powered calculator. Therefore, a common, everyday 60-size engine is 10cc.

4-STROKE PROP CHART

Engine Size(C.I.)	Break-in Prop	Alternate Props
.20 - .30	9-6	9-5, 10-5
.40	11-6	10-6, 10-7, 11-4, 11-7, 11-7 ½, 12-4, 12-5
.45 - .48	11-6	10-6, 10-7, 10-8, 11-7, 11- 7 ½, 12-4, 12-5, 12-6
.60-.65	12-6	11- 7 ½, 11- 7 ¾, 11-8, 12-8, 13-5, 13-6, 14-5, 14-6
.70-.80	13-6	12-8, 13-8, 14-4, 14-6
.90	14-6	13-6, 14-8, 15-6, 16-6
1.20 - 1.30	16-6	14-8, 15-6, 15-8, 16-8, 18-8, 20-6
1.60	16-6	15-6, 15-8, 16-8, 18-8, 20-6
2.40	18-10	18-12, 20-8, 20-10
2.70	20.8	18-10, 20-8, 20-10
3.00	20-10	18-12

ENGINE DISPLACEMENT CONVERSION CHART

Cubic Inches= Cubic Centimeters

.049 cu. in. = .8 cc	.40 cu. in. = 6.5 cc	1.50 cu. in. = 25.0 cc
.09 cu. in. = 1.5 cc	.46 cu. in. = 7.5 cc	1.60 cu. in. = 26.2 cc
.15 cu. in. = 2.5 cc	.50 cu. in. = 8.2 cc	1.80 cu. in. = 30.0 cc
.19 cu. in. = 3.1 cc	.61 cu. in. = 10.0 cc	2.00 cu. in. = 32.8 cc
.21 cu. in. = 3.5 cc	.70 cu. in. = 11.5 cc	2.40 cu. in. = 39.3 cc
.25 cu. in. = 4.1 cc	.80 cu. in. = 13.0 cc	2.70 cu. in. = 44.3 cc
.29 cu. in. = 4.8 cc	.91 cu. in. = 14.9 cc	3.00 cu. in. = 49.2 cc
.35 cu. in. = 5.7 cc	1.20 cu. in. = 20.0 cc	

Conversion Factors
1 cu. in. = 16.3934 cc
.061 cu. in. = 1cc

SPORTY SCALE TECHNIQUES

BABY BOMMA

The man's name is Bram De Gidts. He comes from Siloam Springs, AR, and he builds bommas! I promised to show you what can be done with some of the Royal kits, and this is a great example. Bram isn't a professional modeler—just a very good one. His Flying Fortress has accumulated 23 flights without a hitch. You see, multis can be fun. In fact, the more engines you slap on them, the more fun they become. Why?—because if you lose one of four engines, it's not as bad as losing one of two! That's why Don Srull has such a severe hang-up on this Dornier flying boat thing with 12 or 14 engines. You could lose six motors and the thing would still fly! Anyway, four O.S. 25s power the Royal 17, and, since it captured second place at the Bomber Field B-17 Fly-In last year, it must look as good as it flies.

Wayne Siewert's Mooney PFM has one of the cleanest interiors you'll ever see. There's even a miniature Coke can on the console next to the pilot. The clear glass areas are flawless—no smears, smudges, or nasty fingerprints. The more you look, the more you see!

RAPID-RESPONSE REQUESTS

When writing to a manufacturer, a magazine writer or a well-known competitor, always include a self-addressed, stamped envelope. Make your questions as brief as possible. One letter I received was a questionnaire, and all I had to do was check the appropriate box.

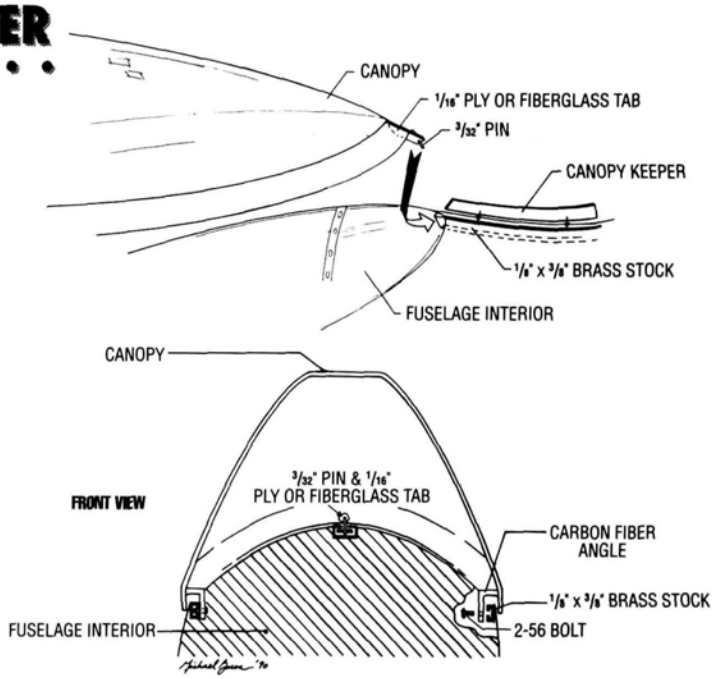
Remember: keep your first scratch-built project simple, and don't forget to check your six! ■

Buyer Beware

Several people have called me about companies that have promised to send them re-issued plans of highly successful kits or new versions of kits that left the market only two years ago. Other "basement operators" have promised prefabricated, exact-scale kits of a design that never even left the ground! Many of you say you never received ordered merchandise, or that the quality of the merchandise you did receive was poor. If you paid by credit card and have a problem or a complaint, contact the credit-card company and lodge a formal complaint against the manufacturer. I'm also aware that many of you have been unable to contact these companies. My advice is simple: ask around. Check out the product and the manufacturer *before* you buy anything. If you're having trouble finding reliable information, contact someone at your favorite magazine. Usually, a self-addressed, stamped envelope will get you a reply. I hope this helps.

CLEVER CANOPY KEEPER

MIKE BACON STRIKES again! Actually, Mike took some time off from his new position as taco taster at a major Mexican restaurant to draw us a fabulous diagram showing how Charlie Chambers, and others with a bubble canopy, make the thing slide open and closed. While the installation borrows a lot from the previously shown sliding canopy, there are a couple of differences. The canopy keeper is used to prevent the canopy from sliding open during flight. This avoids the need to use any unsightly screws or other objects that you might be tempted to use for this purpose. If you follow Mike's sketch, he promises that you absolutely can't go wrong.

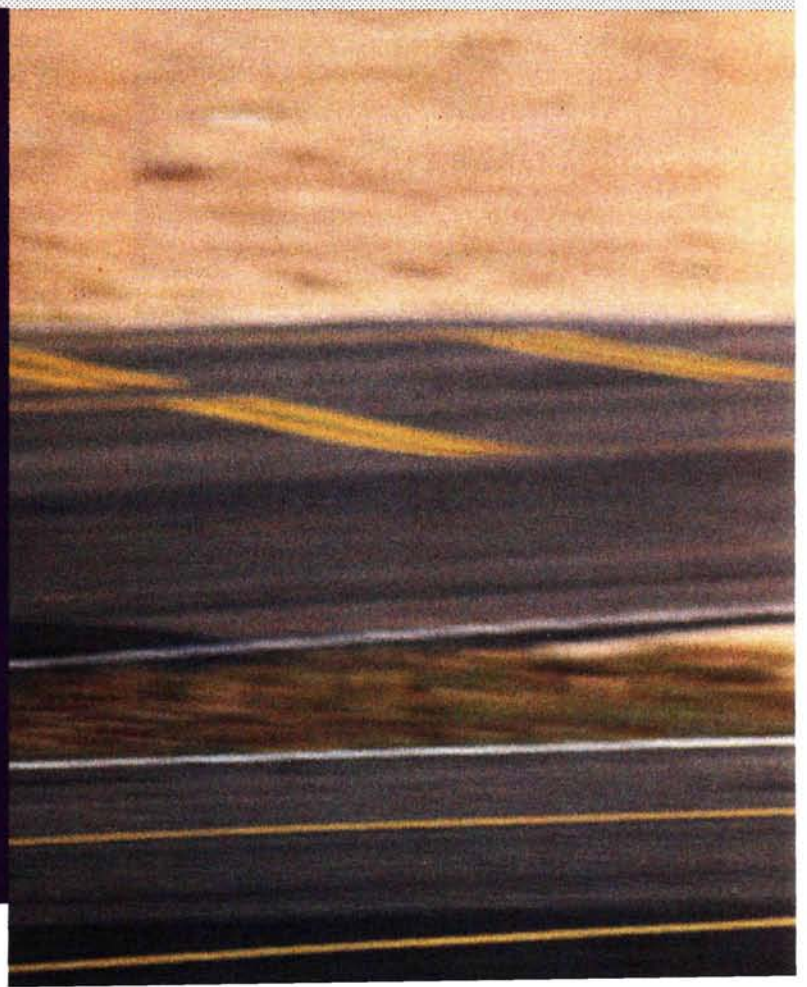


Model Airplane News and Pacer Technology joi

by RICH URAVITCH

SUPPOSE THEY held a scale meet and *everyone* came?! That seems to have been what happened for Top Gun '90, which was held in Mesa, AZ. "Everyone" included competitors, pit crews, spectators, vendors, media people, event staff and many others, who all—if my informal poll has any validity—went away satisfied, smarter and inspired.

For the second year, *Model Airplane News* teamed up with Pacer Technology (the Zap people) to sponsor this "invitation only" scale event, which is quickly gaining a reputation as one of the best scale competitions. Conceived by our "Sporty Scale" columnist, Frank Tiano, Top Gun provides an opportunity for serious scale competitors who have proven their ability to compete with those who have the same credentials. The difficult job of selecting contestants is handled by a committee. Like the salty old air boss in the movie said: "I've gotta give you your dream shot. I'm gonna send you



forces to bring you this premier scale competition

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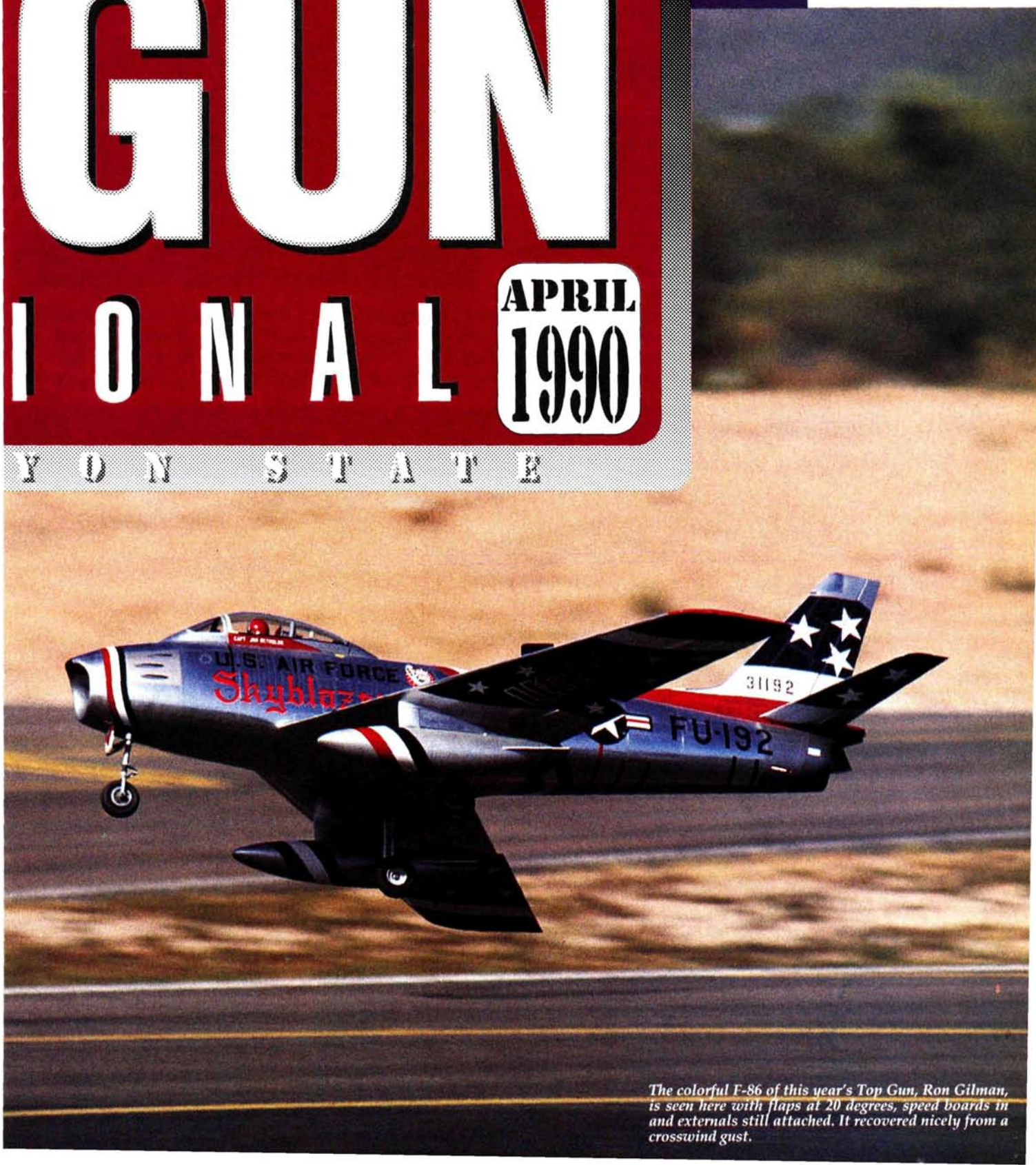
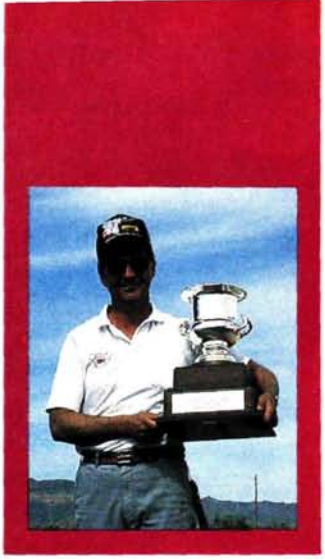


The colorful F-86 of this year's Top Gun, Ron Gilman, is seen here with flaps at 20 degrees, speed boards in and externals still attached. It recovered nicely from a crosswind gust.



PLACE	NAME	AIRCRAFT	POINTS
1	Ron Gilman	F-86F Sabre	174.10
2	Bob Violett	F-86F Sabre	174.01
3	Jeff Foley	A6M3 Zero	172.33
4	Hal Parenti	Ryan Fireball	171.80
5	Shailesh Patel	P-47 Thunderbolt	171.17
6	Charles Nelson	Waco Cabin VKS-7F	167.92
7	Terry Nitsch	F-86F Sabre	167.64
8	Bob Hanft	Nieuport 28C-1	164.64
9	Wayne Siewert	Mooney PFM3200	164.13
10	Gene Barton	A1H Skyraider	163.74
11	Bill McCallie	P-40N	163.16
12	Earl Aune	F4U-5N Corsair	162.62
13	Skip Mast	C-130 Hercules	161.34
14	Clifford Tacie	Savoia Marchetti SM-81	161.31
15	Dennis DeWeese	ME-109G	161.29
16	Bob Francis	Curtiss SNC-1 Falcon	160.92
17	Frank Pring	AT-6 Harvard	160.91
18	Neil Snodgrass	Midwing Special	159.88
19	Brian O'Meara	A6M3-22 Zero	159.10
20	Mel Santmeyers	Beech Staggerwing	158.66
21	Jim MacDonald	F6F-5 Hellcat	158.21

■ *Below left to right: The Yellow Aircraft F-4E Phantom II entered by Ronnie Kemp. Finish duplicates that of 5,000th Phantom built. Powered by a Dynamax/O.S. .90, it didn't lack in performance.* ■ *High individual static score went to this beautiful F-4C built by Larry Wolfe. Note L.E. slats and operating landing/approach lights in nose-gear door. Unfortunately, it crashed on takeoff.* ■ *Luftwaffe fans would have fallen in love with Jack Dorman's excellent rendition of the Focke-Wulf FW-190 Wurger. Like others, it fell victim to crosswind.*
■ *Unusual and colorful subject is Cliff Tacie's tried-and-true Italian Savoia-Marchetti SM-81 tri-motor bomber. Considering the size and lightness of this entry, he did an outstanding job of flying.*

up against the best. You're going to Top Gun"—and so it was for four days in the Arizona desert.

Held at the Spook Hill Flying Field—which is home to the host club: the Arizona Model Aviators—the first two days (Thursday and Friday) were devoted to static judging and practice flying. The demanding (and usually thankless) job of contest director was beautifully handled by Jim Deming, who was ably supported by club members. It soon became obvious that this group of R/Cers has the attention and support of the city administration. The field has two blacktop runways,

Bud Atkinson's mysterious Aeronca LB seemed like it was around just long enough for me to take this picture. Apparently, it was withdrawn from competition before round one of flying—too bad, pretty airplane.

PLACE	NAME	AIRCRAFT	POINTS
22	Bob Frey	P-51D Mustang	156.74
23	Tommy Weemes	Curtiss Hawk 75	156.48
24	Chuck Collier	P-47D Thunderbolt	155.34
25	David Voglund	P-40E	153.46
26	Jerry Ortego	F-86F Sabre	153.21
27	Earl Thompson	Whirraway	149.03
28	Diego Lopez	AD-6 Skyraider	145.53
29	Richard Lewis	AD-6 Skyraider	145.44
30	Chuck Fuller	Stearman	139.49
31	Dick Hansen	Albatros DVA	129.94
32	Mike Kulczyk	Supermarine Attacker	126.70
33	Charlie Chambers	P-51D Mustang	98.77
34	Shane Cramer	P-47D Thunderbolt	90.38
35	Jack Dorman	FW-190	88.53
	Larry Wolfe	F-4C Phantom	92.85
	David Platt	A6M5C Zero	89.81
	John Guenther	ME-109F4	79.75
	Ronnie Kemp	F-4E	75.43
	Al Casey	MiG-3	72.45
	Bud Atkinson	1937 Aeronca LB	70.15
	Stephen Sauger	1936 Stinson Tri-motor	

a sheltered pit area, protected staging and flying boxes and just about anything else fliers could want—except, perhaps, a way to prevent crashes!

Each competitor had a designated time in which his entry would be static-judged, and he knew about it well before the meet. Judging was scheduled to allow a maximum of 15 minutes "in the circle." This system provides skilled judges with more than enough time to evaluate a model, even at this level of competition.

TEAM ENTRIES	AIRCRAFT	POINTS
1 Gerry Garing, Bob Pickney	J-3 Cub	164.99
2. Bill Steffes, Nick Ziroli	B-25 Mitchell	155.05
3 Donald Smith, Frank Tiano	Hawker Sea Fury	135.51
4 Bill Hempel, Sr., Bill Hempel, Jr	JU-87 Stuka	131.16
5 John Elliot, George Harlan	DH Rapide	129.34

The same three judges scored every airplane and, when judging was complete, almost all the contestants agreed that it had been fair—very tough, but fair. Larry Wolfe earned the highest individual static score of the meet (92.85) for his flawless F-4C Phantom, which he made from a Jet Hangar Hobbies kit. The highest team score was that of George Harlan and John Elliot, who garnered 94.59 points for their superb deHavilland Rapide. This was the first year for the "Team" category, and it seems to be a very effective way for excellent builders and equally good fliers to join forces for competition.

Static judging days provided an ideal opportunity for us to take a close look at the entries, as well to enjoy "hangar talk" with other builder/fliers. No doubt about it, the roster looked like a "Who's Who" in scale.

George Harlan's D.H Rapide—this unique entry earned the high static score of the meet, but it only managed 5th place in Team; tough competition!

■ *Above: In addition to all the spectacular models on hand, TG attendees were treated to fly-bys performed by these T-6s and Bill Hane's P-51 Mustang, "Ho Hun."* ■ *Below: Don Muddiman of the Cloud Dancers Show Team gives us his answer to the shrinking flying-field problem: his Flying Machine is hand-launched...vertically!*

It's interesting that all five of the Team entries were scratch-built designs, while those in the Expert, or individual, category were about evenly divided between kits and scratch-built models.

NO "DEAD AIR" TIME

The flying portion of the competition began on Saturday morning, right after Bill Hane's flyby in his full-scale P-51 "Ho Hun" while our national anthem played. I didn't hear it, because my ears were somewhat overwhelmed by the sound of the Merlin in Bill's Mustang; it sang merrily about 10 feet in front of me! (I never refuse the offer of a ride!)

Back on the ground and at the site, I learned that the Wolfe F-4 had become a casualty and that there had been other "close ones." It seems that most of the problems were engine related, perhaps owing to the elevated temperature and altitude, for which some hadn't made adjustments.

This first round of flying was followed by a "lunch break" program of demonstration flying that was designed to entertain the crowd. It entertained everyone, including the Top Gun participants themselves! Performances by Don Muddiman of the Cloud Dancers Show Team, Jerry Kitchin from

■ *Above: Always a consistent performer, Skip Mast's C-130 finished in lucky 13th position.* ■ *Left: Close-up of Skip's "Herky Bird" shows realism typical of all the Top Gun entries. Coast Guard scheme is simple, colorful and attractive.*

JUST COINCIDENCE - RIGHT?

When they're ready to finish their latest creation, scale modelers are all confronted by the same dilemma: "Which full-scale airplane scheme should I duplicate?" The decision usually involves a variety of questions: is it colorful? appealing? will it "wow" the judges? will it be difficult to accomplish? is there sufficient documentation available? Ron Gilman was faced with these questions when he chose the Skyblazers color scheme for his Top Gun-winning F-86. Perfectly executed, it even had the actual pilot's name on its canopy skirt. "Capt. Jim Reynolds," it read.

Jim Reynolds flew lead with the Skyblazers in Europe in the '50s, went on to F-100s, and in 1962, was an advisor in Vietnam. He was involved in an accident near Saigon, and the injuries he sustained left him confined to a wheelchair until his death in September '87.

Throughout the four days of Top Gun activity, many spectators saw Ron's replica of Jim's plane and marveled at its appearance. A local from right there in Mesa (site of Top Gun) showed even more interest than most of the other spectators. At the end of the event, she was introduced to Ron by "Choni" Irvine—an ex-fighter jock who had been a squadron mate of Jim's. The interested spectator's name?—Jimmey Anne *Reynolds*, one of Jim's five children!

California, and the local Arizona Show Team had spectators on their feet and cheering. I've seen a lot of great freestyle, but this was the best ever. When you see Don's little airplane seemingly trying to consume itself as it executes maneuvers, you wonder how it holds together, and Jerry's flying is among the smoothest as he duplicates full-scale maneuvers with his 1/3-scale Extra 230.

Many had their first views of high-performance jets when Jerry Caudle and Terry Nitsch did their 200+mph routine with their beautifully finished Violett Vipers. Way up there in excitement quotient was the show put on by Arizonan Ken Trainor with his hairy-chested, fire-breathing Lockheed P-38. High-speed aileron rolls right on the deck, combined with the synch-sound only a twin can provide, gave the crowd even more to cheer for. One thing's certain: there was no "dead air" time at this gathering!

ROUND II

By the second round (Saturday afternoon), most of the gremlins had disappeared, nerves had calmed, and we saw some excellent flying. The fliers had really done their homework by selecting maneuvers and options that were not only prototypical, but also looked good!

I saw a lot: Bob Hanft's Nieuport 28 flying at a real scale speed—not warp 3; Chuck Fuller's Super Stearman belching smoke and using the engine and the prop in the vertical,

■ *Right: "Tank-top" Ziroli (left) helps Chuck Fuller to recover his Super Stearman after ground loop caused by axle separation. No damage...yet!*

■ *Far right: Chief of Judges Fran Olix (left) explains procedure to Dave Voglund while Dave's "Aleutian Tiger" Curtiss P-40E sits on rotating judging platform.*

■ *Above left: Charlie Chambers was having a really tough time with the engine in his award-winning "Dallas Doll" P-51 from the Platt kit. He did a remarkable job of stretching the dead-stick glide, but he ran out of air speed, which caused the left tip to drop. Moderate damage.*

■ *Above right: Jim McDonald finished in 21st place with his well-executed Grumman F6F-5 Hellcat built from the Holman semi-kit. Attractive color scheme.*

Above left to right: ■ *Curtiss Hawks—a generation apart. The Model 75 by Tommy Weemes formates on the "E" Model of Dave Voglund. Every once in a while the photographer gets lucky!* ■ *All-around nice guy Tommy Weemes used film covering to simulate the highly polished aluminum skin on his Curtiss Hawk 75. This technique is becoming more popular.* ■ *A real shame—Chuck Fuller's Super Stearman after its crash. Apparently a horizontal-stabilizer brace failed, and this allowed the left half of the stab to fold.* ■ *Some of the demo flights were as spectacular as the competition. Note the nose and main gear on Ken Trainor's Baker P-38 deflecting sideways under the load. Right main tire is outrunning airframe!* ■ *Brian O'Meara...what else can we say?* ■ *It took no prompting from the crowd to get Ken Trainor down in the weeds with his smoke-equipped Lightning.* ■ *Ultimate team scale winner, the 1/3-scale J-3 Cub built by Bob Pickney and convincingly flown by Gerry Garing. Mary Lou maintains a watchful eye at right wing tip.* ■ *Last year's 2nd-place finisher, Neil Snodgrass, could only manage 18th this year with his Midwing Special. Flown extremely well; smoke added to realism.* ■ *As the sun sets in the West, Mel Santmeyers does some final engine tweaking on the O.S. 240 4-stroke in his Byron Beech Staggerwing. He placed 20th.*

■ *Above left: Chuck Collier's P-47 applies a little too much "brake" on landing roll out and noses over. The cowl hasn't yet touched, but the prop is gone, and the engine is still running.* ■ *Above: Denny DeWeese's Me-109G stretches its legs to meet the runway, as Bob Frey and his recovery team watch from the background.* ■ *Above right: The Team entry of Steffes/Ziroli was this B-25 built from Nick Ziroli plans. Its British "desert finish" scheme was well-suited to the Mesa, AZ, flying site, and it placed 2nd in Team.*

and the wings the rest of the time; Shailesh Patel's Jug executing the meet's most scale-like takeoffs, approaches and landings; and Bob Violett, with his F-86, performing a routine that could have been taken from the old movie, "Sabre Jet." I also saw (but could have done without) the crashes of Charlie Chambers' Dallas Doll P-51, Jack Dorman's FW-190, Chuck Fuller's Stearman, Dave Platt's A6M-5C Zero and Steve Sauger's Stinson Tri-Motor. There must have been literally years of work behind these masterpieces, and I hope some of them will fly again. The competitors didn't know it then—none of us did—but the best flying conditions of the meet would, after round two, be history.

TOP BUNS?

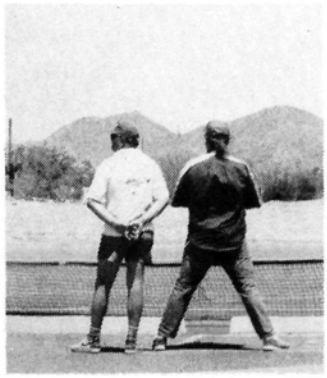
Since the Arizona Golf Resort was the headquarters for the event and most of the contestants were staying there, it was natural that Saturday night's gala banquet be held there. About 250 of us joined in the festivities, which included a great meal, the presentation of awards from industry supporters, some good-natured "roasting" and special recognition of certain individuals. One of these awards was bestowed by the "Ladies of Top Gun" (who prefer to remain anonymous!) to none other than than Brian O'Meara. He won the coveted, and much-sought-after, "Top Buns" award for his accomplishments in this highly competitive area. The photo shows his entry. Our congratulations and admiration to you, Brian.

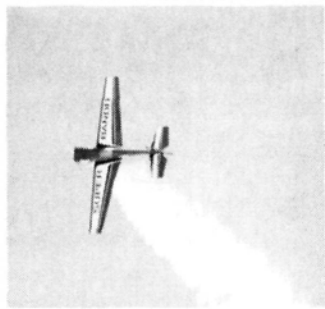
That was the flavor of a most enjoyable evening, but it was soon recognized that the critical rounds were mere hours away, so ZZZZZ...

BATTLING THE BREEZE

Something told me that Sunday's weather might be a little different from Saturday's. When I arrived at the field, things looked normal enough—just a slight breeze down the runway—but as the day went on, the breeze intensified, and to make things worse, it started blowing almost directly across the runway.

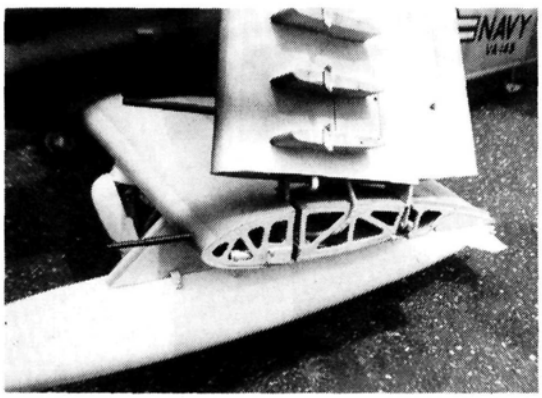
We then had a chance to see which fliers had spent a lot of time practicing under adverse conditions. After sizing-up their position and potential, some wisely declined to fly and





Top: Ever notice the flying style/position of various fliers? Jerry Kitchin watches his Extra 230 from a "solid foundation"!

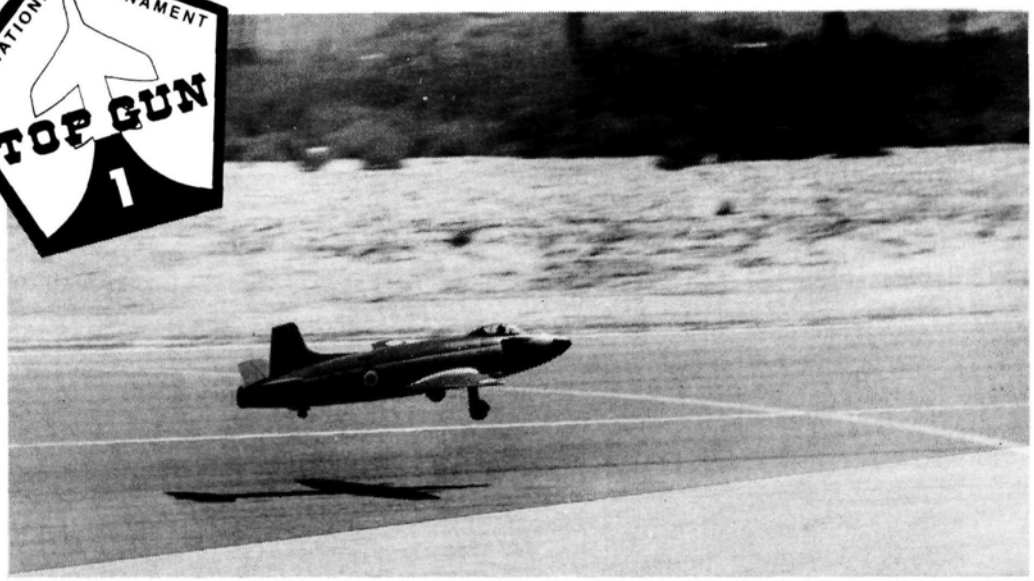
Above: The smoke trail relative to the position of Jerry Kitchin's 1/3-scale Extra 230 gives an indication of the wild maneuvers he flew during the demo part of the event. He sure has magic fingers!

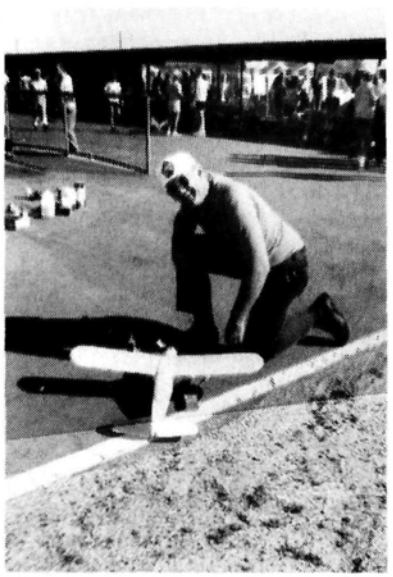


Wing-fold mechanism on Gene Barton's A-1 Skyraider, which was one of three on hand. Sister ships by Rick Lewis and Diego Lopez won "Engineering Achievement Award" and "Critics' Choice," respectively.

SPECIAL AWARDS

AWARD	RECIPIENT/AIRCRAFT	SPONSOR
Best Military	Charlie Chambers/P-51	Top Gun
Best Civilian	G.Harlan/deH.Rapide	Top Gun
High Static	G.Harlan/deH.Rapide	Top Gun
Critics' Choice	Diego Lopez/A-1 Skyraider	Top Gun
Best Color and Markings	Ron Gilman/F-86F	Aeroloft Design
Best Engineering Achievement	Rick Lewis/A-1 Skyraider	Robart Mfg.
Best Craftsmanship	Bob Pickney/J-3 Cub	Grifhold Tool
Top Buns	Brian O'Meara/"Flanker"	Ladies of T.G.





Above left: Just breaking ground is the newest from Mike Kulczyk's hangar—a Viojett-powered Supermarine Attacker. It's one of very few tail-dragger jets ever produced.

Above right: "Big John" Elliot, a scale star from the West, fires up his Cox Fairchild 24. Its size was a disadvantage in this competition, so "B.J." teamed up with George Harlan and the beautiful D.H. Rapide.

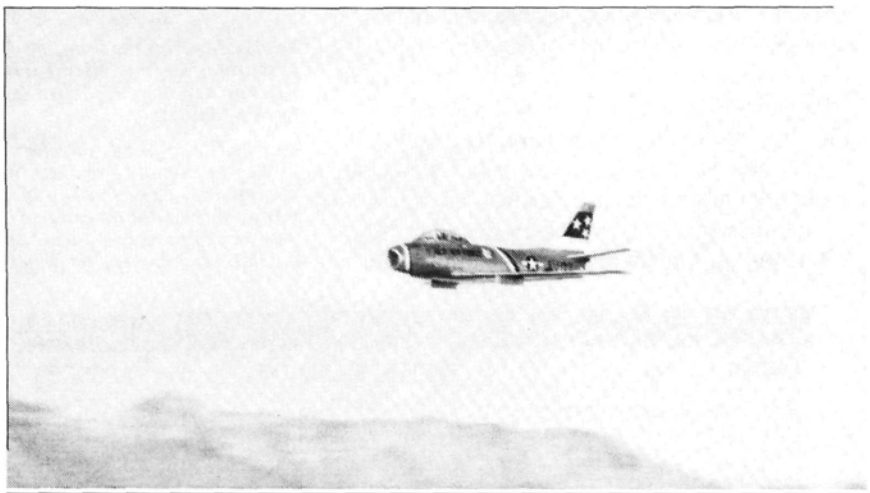
gave up their chance of placing. They became spectators like the rest of us, but they went home with intact airplanes.

Cliff Tacie really impressed me. We don't hear a lot about him, but he flew his Savoia-Marchetti SM-81 extremely well. Despite its lightness (it weighs only 15 pounds and was one of the lightest airplanes there), his mandatory, slow flybys were straight down the runway, even though the airplane was "crabbed" about 30 degrees into the crosswind.

Two of scale's "movers and shakers": Top Gun's Frank Tiano (left) and ScaleMaster's Harris Lee.

Practice, practice, practice! Most of the fliers had adjusted their flying styles, and some excellent scores were carded. The larger, heavier airplanes obviously did better in the strong wind, so many pilots improved on their previous day's scores. The 1st-place Team of Bob Pickney and Gerry Garing—flying an exquisite, 1/3-scale J-3—managed to do this. Plagued by difficulties on Saturday, they rallied on Sunday and eventually prevailed over the Steffes and Ziroli B-25 by nearly 10 points.

At the end of the scored flights, a quick look at the scoreboard showed that the results would be close. How close? How about .09 of a point! That was the final difference between Mr. Top Gun and his Best Man. Ron Gilman out-scored Bob Violett by the narrowest margin, but I don't think Bob really minded, as

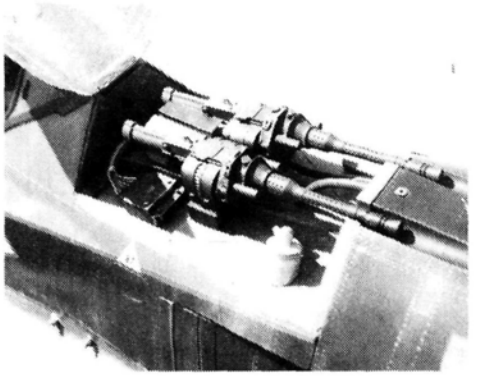


■ *Top photo: Hal Parenti makes a last-minute check of his "turn and burn," mixed-propulsion Ryan FR-1 Fireball, which earned 4th place in Expert. Ducted fan inside; glow engine up front. The static-judging stand worked well.* ■ *Middle: Diego Lopez's A-1 Skyraider was finished in Vietnam-era markings. This outstanding model received the Top Gun "Critics' Choice" award, and it was well-deserved.* ■ *Bottom: Could be some A.F. gunnery range, circa 1952, as Top Gun Ron Gilman's F-86 blasts across the desert!*

The Australian Commonwealth Whirraway was Earl Thompson's entry. This airplane weighs 26 pounds and is powered by a Zenoah G-62.

Newest in a long line of successful C-130 "Herky Birds" from Skip Mast. Its four K&B 3.5s ran flawlessly during many flights, including one for "live" TV. MAN plan no. 12811 is available so you can build your own!

they were both flying F-86 Sabres built from Bob's kits. Part of Bob's 2nd-place prize package was—guess what? Bingo!—an F-86 kit that he had donated! I guess he figured that he really didn't need another one, so he awarded it to the Arizona Model Aviators club in recognition of their outstanding job of



Some details modelers put into their TG airplanes is incredible...and they fly them, too! Jack Dorman lifted the gun deck on his Platt-designed FW-190 to show us the twin cannons.

making their facility available and giving their support. This prize was supplemented by a donation from Herschel Worthy (national sales director for Pacer), who donated $1,000-worth of Zap products to the club.

The table on which the awards were displayed seemed to sag under the weight of the trophies, plaques, kits, radios and accessories donated by the sponsors and members of the industry; their total value was over $20,000! Everyone agreed that the event was one of the best in which they had ever participated.

Plans are already under way for Top Gun '91: potential sites are being examined, and the selection committee is probably looking at a list of possible competitors. The location will change; the list of who's invited might change; but the spirit, enthusiasm and excitement of Top Gun won't. See you next year! ■

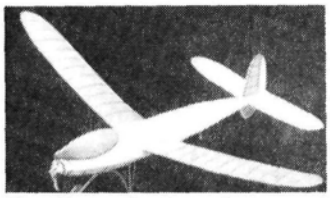
FIFTY YEARS AGO

ON THE FLY

by KATHERINE TOLLIVER

WHAT HAS A 2½-inch wingspan, three pairs of legs, and buzzes?—a bug glued to a very small glider, and with a very small amount of time and money, you could have had one, too. *MAN's* August 1940 issue supplied the full-size drawing of this glider; you supplied the bug. Materials?—1/64-inch-thick balsa, some microfilm, a drop or two of glue and a healthy bug—a common housefly would do nicely. Three-minute flights were supposedly possible. A "bi-motor" version was tested, but it was impossible get the flies to synchronize their "engines."

If mini gliders were starting to bug you, then you have could tried the "Jasper"—a relatively easy ship to build with a flat-sided fuselage, a single-blade folding propeller and no spars in the wing or tail. A larger than normal number of ribs presumably added torsional rigidity. This design showed that the interest in longer motor runs was growing. The Jasper in actual flight had been clocked consistently at 1 minute, 15 seconds after the propeller folded. In full flight, the model had a steep, steady climb and great soaring ability.



The "Jasper": clean design and simple construction. Shown here with propeller folded.

The 28.5-foot, 2400hp Grumman XF5F-1 (appropriately called the Skyrocket) was one of the Navy's latest designs. It appeared on the cover for this issue, and one could sense the power of its two, giant, Wright engines that were mounted on a single 42-foot wing. The fuselage, with an almost non-existent "nose," began at its point of attachment to the wing, just aft of the wing's leading edge. The non-retractable tail wheel had a locking device for takeoffs and landings. This long-range, single-seat fighter carried extra fuel, two cannons and four machine guns, and its top speed was 450mph. Performance figures were classified information, but a Grumman test pilot reported that he took the plane completely off the ground in less than 7 seconds—an indication of its fast climbing abilities.

THE ANSWER

Gas fans could build the "Answer": a dual-purpose gas model that could be flown in either Class A or B contests, depending on the size of the engine. The wing of this rugged, dependable ship generated high lift for maximum efficiency. For its first flight, it was suggested that the ship be given a 20-second motor run under low power. It was supposed to circle to the left (both under power and in the glide); this eliminated the dip when the motor cut, and it saved altitude that had been gained on the motor run.

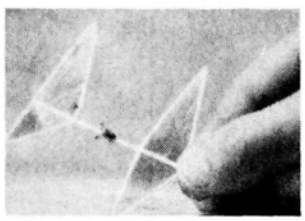
The "Answer" was a stable gas model that could climb rapidly.

NATIONALS PREVIEW

Among the entries for the 1940 Nationals previewed in "Gas Lines" was one of the first mail carriers—the Douglas M-2 mailplane, and a ½-inch scale U.S. Army autogyro. Also mentioned was a Douglas 0-38 that had a wingspan of 30 inches and was built to ¾-inch scale. The motor and cockpit were carefully detailed, and there were movable controls and a rear gun. Today, it might have even been a Top Gun competitor.

A FLY-IN

Ed Packard's Cleveland Model & Supply Company (it's still going strong today) ran an interesting ad. For $1.50, you could order the Cleveland Viking with a 48-inch span, and for only 25¢, you could order other models that flew—a dragonfly, a flying fish, a barn swallow, a bluejay, a swallowtail butterfly and a vampire bat. Now, if you had some friends to help you launch all these creatures (don't forget the above-mentioned fly-powered performer), you could have staged an interesting air show with some of the participants consuming each other. ■



Flights of 3 minutes were reported with "fly"-powered planes.

by RANDY RANDOLPH

WHAT MAKES very small R/C airplanes (VSR/C) practical?—small, powerful engines and small, powerful radios! Thanks to Cox* and Futaba*, both are available.

Many .010s are left from the old days, but most people considered them collectors' items and were reluctant to put them in airplanes for fear of loss or damage. But, now that Cox is again producing the TD .010, parts and new engines are available, so that fear should vanish, and the power requirement of a VSR/C has been met.

The other necessary factor has been available from Futaba for quite a while: the FP-R2H receiver and the S33 servos. That combination of receiver and two servos weighs in at less than 2 ounces and, with Ace R/C's* 110mAh battery pack, the total flying weight is just over 3 ounces! That's a lot of radio for so little weight.

Sheri Smothers checks engine run outside author's shop. Full tank offers about 3-minute run.

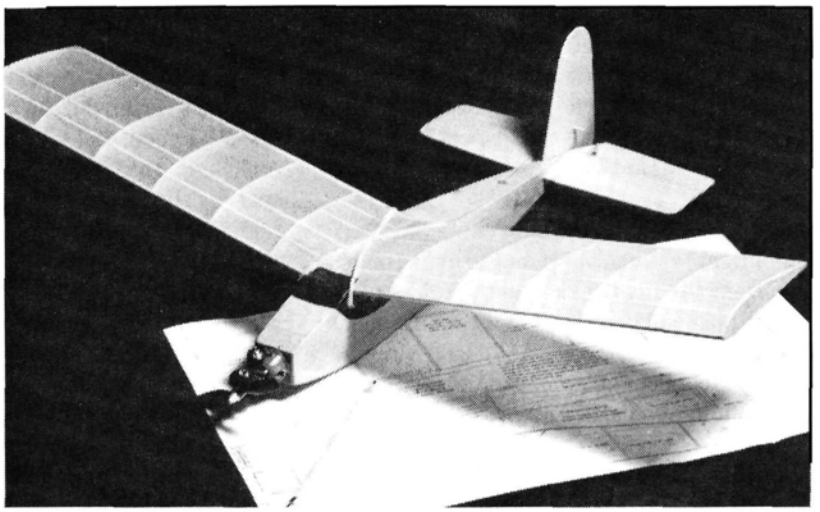
PHOTOS BY L.F. RANDOLPH

An 1/8A R/C for the newly reintroduced Cox TeeDee .010—makes schoolyard scale seem like giant scale!

The power and radio equipment are available, but what about the airplane? Designing a VSR/C airplane shouldn't be much of a problem. The size is so similar to rubber-powered sport airplanes that simply adapting one of those designs would be logical and will, in fact, work to a great extent, but there are a few other considerations.

Even with the light equipment, the servos, receiver and battery are considerably heavier than anything associated with a rubber model of a similar size. This additional weight requires a stronger wing and tail construction,

ONECENT



and this adds slightly more weight.

Another important consideration is the scale effect. A small wing is simply unable to generate as much lift per unit of area as a larger one. Therefore, to generate enough lift, the wing must have a lower weight loading per square foot of area. That means a larger wing is needed, and that increases drag and weight. Somewhere, there's a perfect size for the airplane and the weight it must carry—one that matches the power available. The trick is to *find* that size!

Onecent isn't the ultimate VSR/C; it could be built larger, cleaner and lighter, but I wanted to build an airplane that flies well, is relatively light and easy to build without using indoor-type model-construction. It's a solid performer with no bad habits, and it will satisfy *anyone*. It's a *very* good airplane!

You could use the Cox .02 as well as the .01, but you'd have to add 1/8 inch to the width of the firewall and move the battery pack aft to compensate for the increase in weight up front. Since Onecent flies so well with the .01, it should be a screamer with the larger engine!

CONSTRUCTION

I built Onecent with 4- to 6-pound balsa, and it's important to select that weight of wood carefully. Use CA or model airplane cement (Ambroid or Testors) in all areas except the firewall and the elevator and rudder-to-fuselage joints.

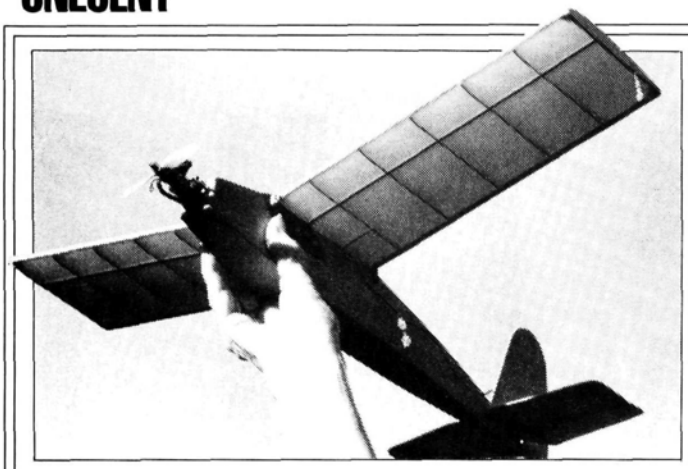
Slice the fuselage sides from 1/16-inch sheet to the outline shown. Add the 1/16-inch balsa doublers in the nose and cabin areas and the 1/16-inch square uprights aft of the wing. Use CA to glue the small 1/64-inch plywood tripler at the firewall, and hold both sides together with masking tape while you sand them to the same outline. While they're held together, mark the former locations and drill the 3/32-inch holes for the wing dowels.

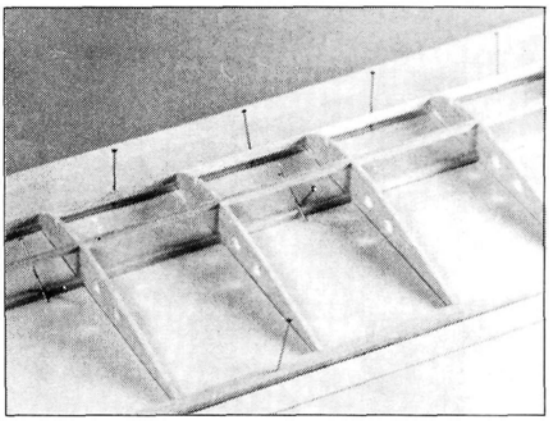
Build up the two cabin formers from 1/16x1/8-inch balsa strips. Cut out the 1/8-inch ply firewall, and add the 1/8-inch ply back-up strip. Using the engine as a template, mark the location of the mounting holes, which should correspond with the back-up strips, then drill the holes with a 1/16-inch drill.

Glue the two formers into place on one fuselage side, then glue the second side to the formers. Be sure everything is square, and when the glue has set, bring the tail together at the tail post, check the alignment and glue. Mount the firewall with epoxy and be sure everything is true before the epoxy cures. Sheet the top and bottom with

SPECIFICATIONS

Type: *Miniature sport*
Wingspan: *23 inches*
Weight: *9 ounces*
Wing Area: *103.5 square inches*
Length: *16 1/2 inches*
Wing Loading: *12.5 ounces per square foot*
Power Req'd: *Cox TeeDee .010 or .020*
No. of Channels Req'd: *2 (rudder/elevator)*
Comments: *This mini-sport model was designed to mark the re-introduction of the Cox TeeDee .010 engine. Its simple construction is reminiscent of old-time, rubber-powered models and employs conventional materials (balsa and ply). Because of its diminutive size, it requires "micro"-sized R/C equipment.*





Far left: Hand shows size of Onecent. Author's wife, Helen, obliges.

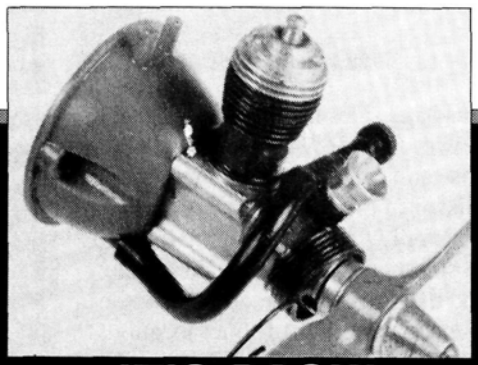
Left: The wing is built right over the plan. When both panels are complete they're joined at the center, then the center spars are added.

cross-grain 1/32-inch sheet.

Mark the location of the fairleads on the sides and top of the fuselage. Drill or cut holes in these areas to accept small 1/4-inch lengths of inner Nyrod. Position the Nyrods in the holes so that they point to the servo location in the cabin and glue them into place. When the glue has set, trim and sand them flush with the fuselage sides and top. Sand the finished fuselage with fine sandpaper.

THE WING

The wing is built over the plan in the conventional way. Slice the ribs from light 1/16-inch sheet and strip the spars and trailing edge from slightly heavier stock. Hold the trailing edge on the plan and mark the rib locations, then notch the trailing edge at these marks. Build one wing half at a time. Cover the plan with wax paper, and pin the trailing edge and bottom main spar into place on the plan.



IT'S BACK!

After a 10-year pause, Cox is scheduled to start producing the TD .010 again this year. Even though the new engines will be interchangeable with the originals, the'll have parts of a different color to distinguish them from those on the older model.

Most owners of original .010s are reluctant to use them because they're irreplaceable, but this new production should spark much more activity in this truly *small* category. *Model Airplane News* starts the ball rolling with this presentation of Onecent. Any others out there?

Set the center rib at the dihedral angle shown, then add the rest of the ribs and the top spars and trailing edge. When the glue has set, remove the wing and build the other wing half over the same plan by reversing ends with the center ribs.

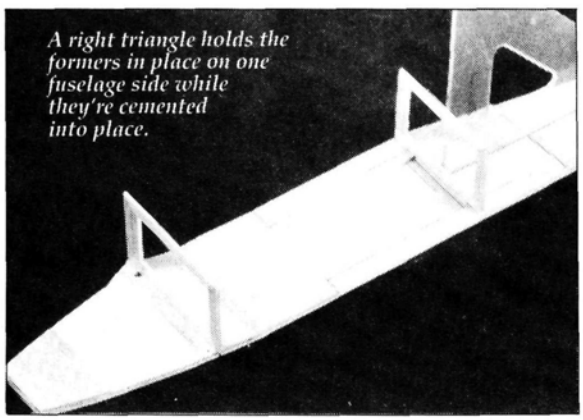
Carefully sand the spars and the leading and trailing edges flush with the center ribs. When the center ribs are joined, the wing should have the proper dihedral angle. Add the webs between the top and bottom spars as shown, and the partial spars at the center section. Sand the completed wing.

THE TAIL

The tail surfaces are made from very light, 1/16-inch sheet. Cut the complete fin/rudder and stab/elevator outlines, but don't make the rudder cutout in the elevator at this time. Don't separate the moveable surfaces until they have been covered. Cut out the two control horns from 1/32-inch plywood and set them aside. They will be installed when the surfaces are hinged.

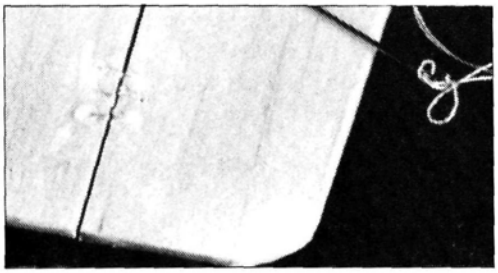
COVERING

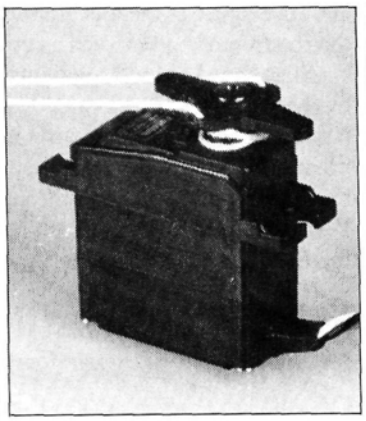
Cover the entire airplane with Japanese tissue. Use thinned white glue, which is a very good adhesive for this material. Attach the covering only to the center and tip ribs, and the leading and trailing edges. You'll need four pieces of tissue to cover the top and bottom of both wing halves. When the covering is complete and the glue has set, shrink the tissue by spraying it

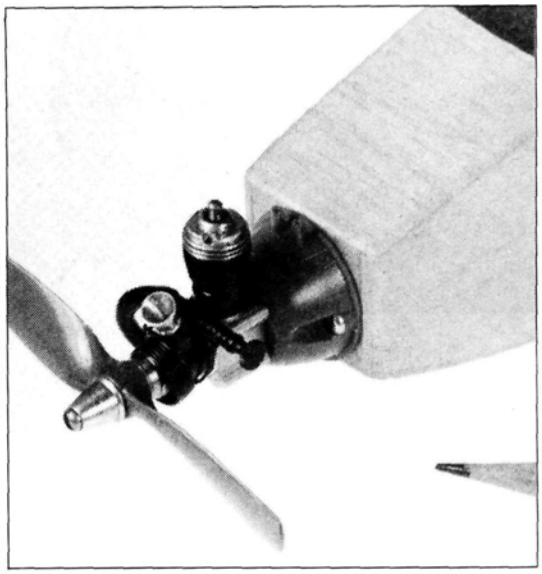


A right triangle holds the formers in place on one fuselage side while they're cemented into place.

■ *Below: A "figure-8" or "baseball" stitch is used to sew the hinges. This type of hinge was one of the first ever used on model aircraft.* ■ *Right: String is used to show how the control cables go down, around and back up through the servo horns. Futaba S33 servo shown.*







with a fine mist of rubbing alcohol or water.

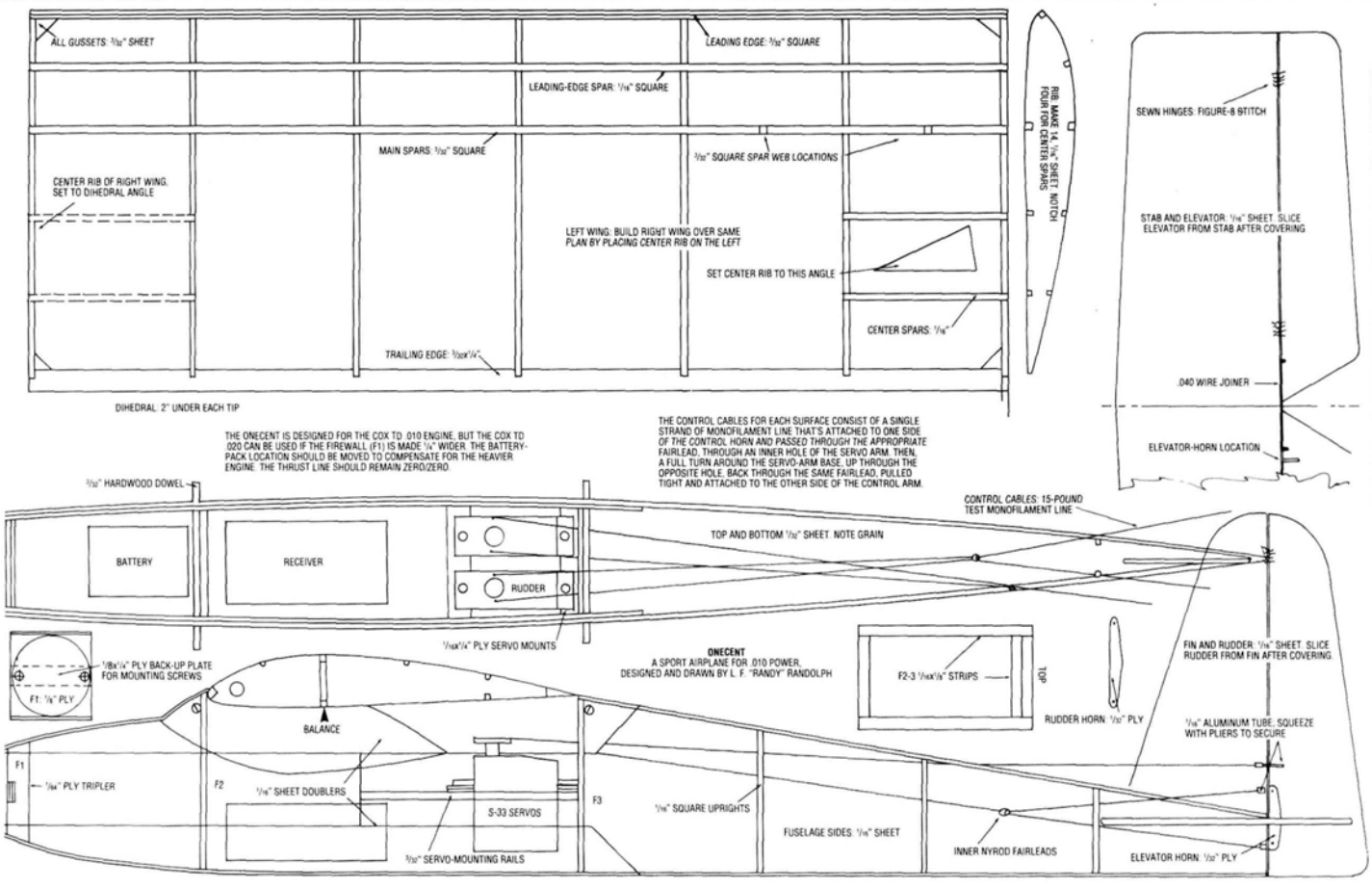
Using the thinned white glue, attach the tissue to the entire sheet surfaces of the fuselage and tail. Don't forget to cover the firewall as well. When the glue is completely dry, give everything at least three coats of clear, fuelproof dope.

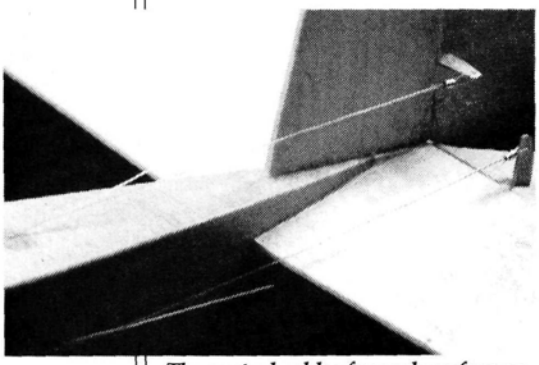
Using a metal straightedge, slice the rudder from the fin and the elevator from the stab. Epoxy the .040 wire carry-through to the leading edge of the elevator and make the rudder notch in the trailing edge. Notch the leading edges of the rudder and elevator and install the control horns, then hinge the surfaces. The hinge shown is the old thread-type, which is made by sewing a figure-8 stitch between both surfaces in the locations specified. Apply a coat of dope to the edges of all the surfaces.

Trim the covering away from the center of the stab where it goes through the fuselage, slip the stab into the slot, check alignment carefully and glue it into place. Cut a slot in the top sheeting to receive the fin and, after checking alignment, glue it into position. Glue the 3/32-inch dowels through the fuselage at the wing saddle, and the structure is then complete.

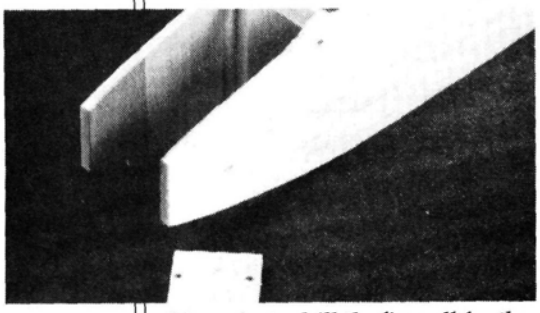
GAINING CONTROL

Install the servos, the receiver and the battery where

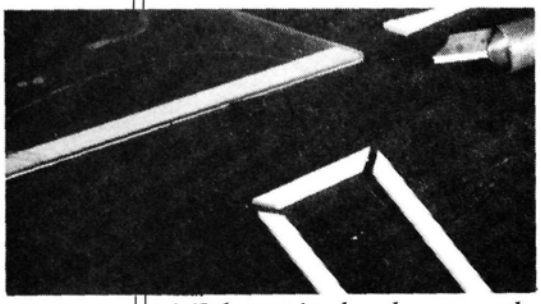




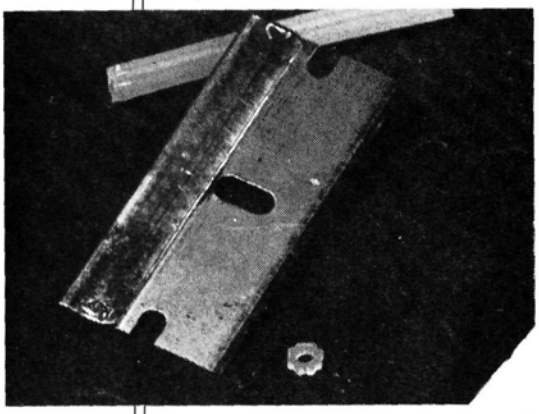
The control cables for each surface go from the horn, through a fairlead around the servo then back through the same fairlead and to the other side of the horn. They're anchored by crimped 1/16-inch aluminum tubing.



It's easier to drill the firewall for the engine-mount screws before you epoxy it to the fuselage sides.



A 45-degree triangle makes easy work of producing the picture-frame-type fuselage formers. Use a square to check the finished product.



The control-cable fairleads are small "doughnuts" that have been sliced from the inner Nyrod and thence-mented through the fuselage sheet at the positions indicated.

shown on the plans; the antenna exits the airplane between the wing and fuselage. Set the elevator and rudder trims at neutral, and check the rotation of both servos as control is given.

Slice four 1/16-inch segments of 1/16-inch aluminum tube by rolling it on the bench while pressing down with a single-edge razor blade. Prepare a 2-foot length of sewing thread and two 3-foot pieces of 15-pound (.015 inch) monofilament fishing line. Find the center of the monofilament and push it through the fairlead that serves the elevator. Bend a hook in a 6- or 8-inch length of light wire, and use it to "fish" the loop into the cabin area. Anchor it with a piece of tape.

VSR/Cs are fun, and 6 ounces of fuel will keep them flying all weekend!

Tie one of the cable's loose ends to the thread, and tie a knot in the other loose end so it won't slip through the fairlead. Now, pull the piece of cable with the thread through the fairlead and into the cabin area above the servos. Untie the thread and run the cable through the inner hole in the servo arm; make a full turn around the base and back up through the opposite inner hole. Center the cable loop in the servo arm, pull it tight, and hold it in place by sticking a piece of tape on top of the arm.

Now, once more, tie the thread to the same end and pull it back through the fairlead. Slip one of the pieces of aluminum tubing over the cable, then run it through the hole in the elevator arm and back through the aluminum tubing. Hold the elevator in neutral and pull the cable tight, then slide the tubing up against the horn to cinch the cable in the horn. Untie the knot in the other end of the cable, slip the tubing on and run it through the other side of the same horn and pull it up tight as before. Adjust the cable in the horns until the elevator is at neutral, and squeeze the tubing with pliers. Trim the excess cable.

Use the same system to hook-up the rudder cables, then be sure that both surfaces move in the directions indicated by the transmitter stick.

Although it's of little use, you can make a landing gear by bending .040 wire into a "V" and holding it, inverted, in place between the engine and firewall with the engine-mount screws. Very light 1-inch wheels complete the assembly.

PERFORMANCE

The long antenna looks as though it will get in the way, but it causes no problems in the air. Be sure the airplane balances as shown on the plan and that there are no warps in the wing or the tail. Set the transmitter to low rates, and it's time to fly.

Hand-launching is a snap: just start and lean the engine, point it at the horizon, and throw it just as you'd throw a baseball! Climb up to about 50 feet and trim for level flight. When you have the "feel" of the Onecent, switch to high rates and do some loops and rolls. I think you'll be impressed with its performance.

The engine run lasts only about 3 minutes with the regular tank, so climb up to a reasonable height and get some gliding time. Its glide is flat and relatively fast, but if you apply too much elevator, the Onecent will "mush down" almost like a helicopter. When flying in a little breeze, it isn't that difficult to make it glide right back to your hand.

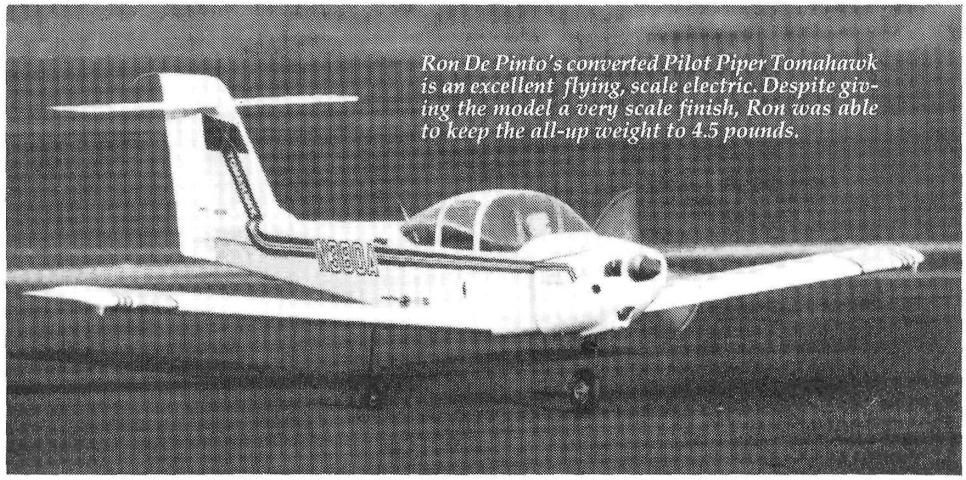
VSR/Cs are fun, and 6 ounces of fuel will keep them flying all weekend!

**Here are the addresses of the companies mentioned in this article:*
***Cox Hobbies Inc.,** 1525 East Warner Ave., Santa Ana, CA 92705.*
***Futaba Corp. of America,** 4 Studebaker, Irvine, CA 92718.*
***Ace R/C, Inc.,** 116 W. 19th St./Box 511C, Higginsville, MO 64037.* ■

QUIET FLIGHT

SPOIL THE LIFT; ENCOURAGE THE CHILD

by JOHN LUPPERGER



Ron De Pinto's converted Pilot Piper Tomahawk is an excellent flying, scale electric. Despite giving the model a very scale finish, Ron was able to keep the all-up weight to 4.5 pounds.

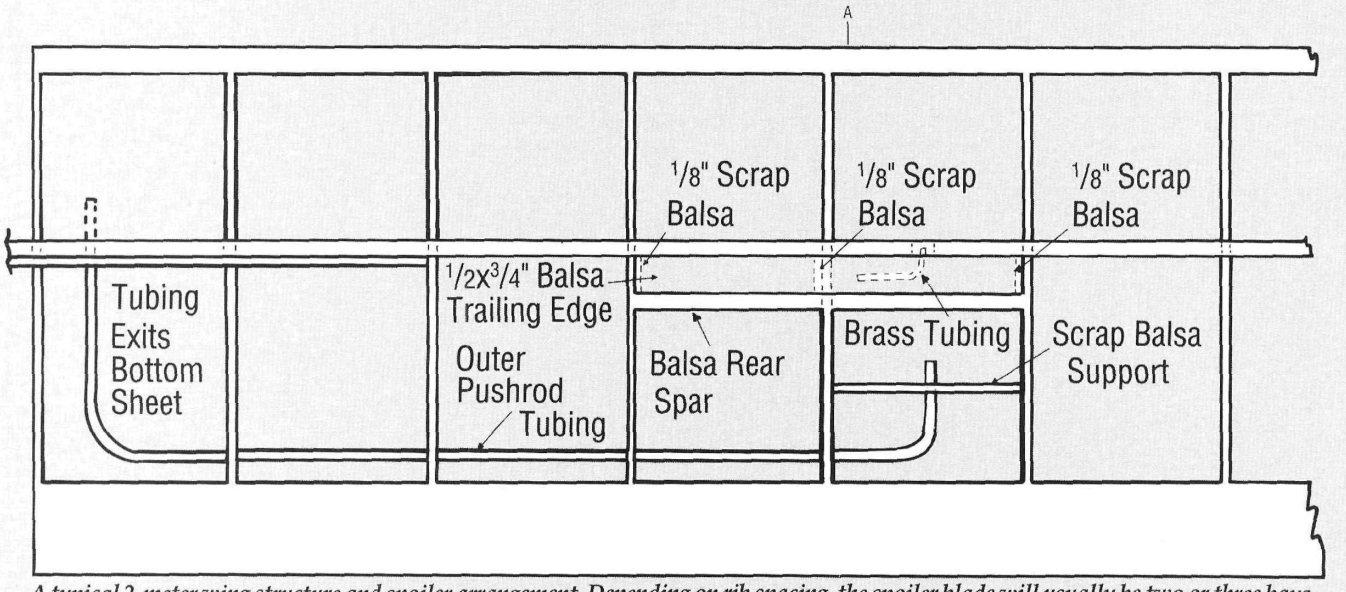
AS I PROMISED last time, here are some drawings to help you install simple, flip-up spoilers in your next glider. These spoilers can be used in any built-up wing, whether it's an open structure, a D-tube, or a fully sheeted wing. This type of spoiler is best operated from a single servo in the fuselage. It's usually made from a section of trailing-edge stock, but you can also make it from a combination of balsa and plywood.

Prepare the ribs where you intend to fit the spoilers by marking them with the same piece of the trailing-edge stock that will be used for the actual blades. Directly behind the top spar notch, mark the shape of the spoiler blade on the rib (the large side of the trailing-edge stock towards the spar), approximately 1/32 inch below the top edge.

Remove this area from only the ribs that are affected. Don't cut the ribs at each end of the spoiler. After doing the basic frame-up with the spars, use a piece of 1/8-inch-square balsa, and cut a few pieces approximately the same length as the spoiler blade is wide. Lay the blade in the opening, and then slide the 1/8-inch balsa up from underneath the blade (hold it against the outside rib) until you lift the blade slightly above the upper surface of the wing. Zap* the 1/8-inch balsa to the rib. Holding the blade firmly against this brace, repeat this for the center ribs and the outside rib on the opposite end. Check that the blade rests firmly on each brace and that it doesn't wobble. If necessary, trim the braces until the blade rests on each one.

Now, lay the blade in the opening, and sand it to the contour of the upper wing surface. This is the reason for lifting it above the upper

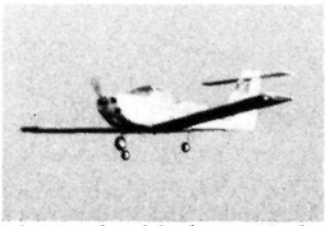
(Continued on page 60)



A typical 2-meter wing structure and spoiler arrangement. Depending on rib spacing, the spoiler blade will usually be two or three bays long, and 1/2 to 3/4 inch wide. This may seem small, but remember: a spoiler should give a controlled descent, not a controlled crash.

surface; otherwise, you'd have a flat blade on a curved surface. This produces a much cleaner wing and ensures that the spoiler will only spoil the wing's lift when it's open!

The spoiler horn is made from a piece of brass tube that's about 1 1/2 inches long and wide enough to fit a toothpick. Make a gentle, 90-degree bend in the tube without kinking it. Glue it to the blade (about to the middle) with approximately 3/8 to 1/2 inch protruding forward of the blade's leading edge. Depending on the type of shear webs on your model, you might have to cut a hole in the shear directly in front of the tube for clearance.

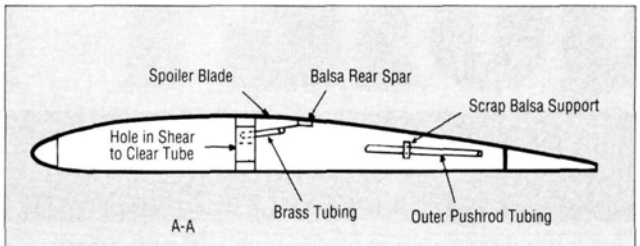


The Tomahawk looks great in the sky. This is the kind of electric model that makes true believers out of glow-power pilots.

Drill a hole in the rear of each rib between the spoiler blade and the wing root. Insert a section of pushrod tubing through these holes, and have it exit at the bottom center of the wing, just behind the spar. This tube will house the "string" that will actuate the spoilers. The best material for this is dial cord, which was used to move the dial in early radios. It can still be found at some electronics stores, but if you can't find it, Dacron 1/2A control line also works well. The reason for using specific types of line is to get a material that won't stretch.

Pass enough of this material through the pushrod tube to reach the spoiler horn, and extend it a few inches past the wing root. Make a small loop at the root end to fit over a ball link installed on the servo arm. At the spoiler end, pass the line up through the control-horn tube, and secure it with a small piece of toothpick pushed into the rear of the tube with the line. After the wing has been covered and attached to the fuselage, the line's length can be adjusted so that both spoilers open at the same time. I usually use either tape or covering material for the spoiler hinge.

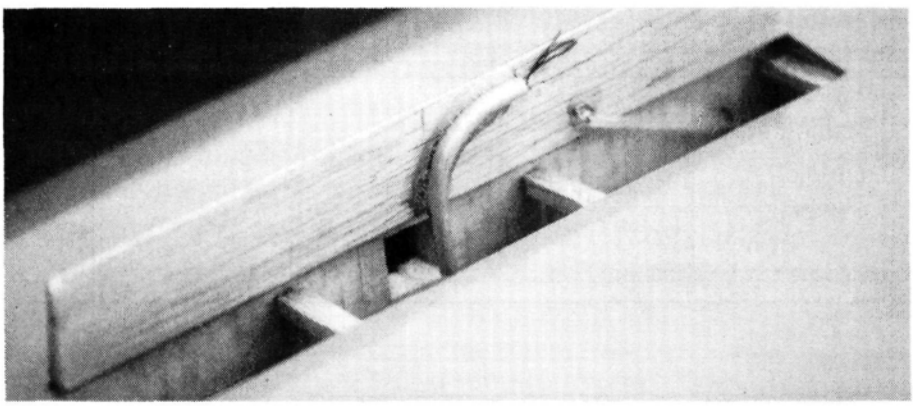
After everything has been adjusted, make sure that your spoilers will shut solidly. It's best to tension them with small rubber bands. Make two hooks out of small straight pins (the heads help hold the bands in place). Glue one to the bottom of the spar shear web, and the other halfway across the blade approximately 1 inch away from the other. Stretch a small rubber band across the two, and your spoilers will shut solidly every time.



Profile view of wing at spoiler location. Depending on the type of shear webs on your wing, you may have to cut a hole in the shear to clear the brass-tube spoiler horn (usually necessary with an I-beam shear web).

If you prefer, make your spoiler blade by cutting a piece of 1/32-inch plywood to the same size as the blade opening. Then glue a piece of 3/16- or 1/4-inch medium balsa to the ply. Cut the notch in the ribs so that the blade protrudes approximately 1/16 inch above the wing, and sand to shape. This type of blade is less prone to warping when covered with heat-shrink covering.

I hope this clears up some of your questions on spoiler installation. This is just one method, but I'm sure other ways work just as well. If you'd like to have other areas of construction detailed, drop me a line, and I'll consider it for a future column.



With the blade open, you can see the brass-tube spoiler horn, the clearance hole in shear web, and the hold-down rubber band. This is the easiest type of spoiler to construct and adjust.

ELECTRIC SHOCKS

I read an interesting article on electric shocks in the Watts Current newsletter of the Westmoreland Electric Soaring Society of Pennsylvania. Can you be shocked by electric-powered models? The answer is, maybe yes; maybe no. Some people believe that only AC current can shock you and that DC current can't. The fact is that any current passing through the lungs and heart is dangerous, although it does take more DC to produce the same results as AC.

With electric models, the risk of shock is reduced because a low voltage is usually used, and there isn't usually a good ground on your body when you come in contact with anything electric on your model. The exceptions include using an AC charger at home and working with tools at a workbench.

The body's resistance varies from person to person, and it can also vary within each of us. One man measured his resistance with a digital ohmmeter many times during a week, and he obtained readings

from 385 to 715 ohms with one lead squeezed between his thumb and forefinger in each hand. Remember, current is measured in amps, or, in this case, milliamps. Either the high or low measurement should cause *fatal* shock with 110 volts AC, or reflex action up to muscular inhibition with the 43V max that he used with a Cobalt 60 battery pack. (This is a worst-case scenario.)

Divide volts by resistance (ohms) to get amps or milliamps (thousands), e.g., 43 ÷ 715 = .060 amp, or 60 milliamps.

The list below was taken from Military Standard 454. The length of time current flows through the body and current values are important. However, at the higher values, no amount of time may be too short (no pun intended).

CURRENT (in milliamps)		EFFECTS
AC	DC	
0-1	0-4	You'll notice it
1-4	4-15	You'll be surprised
4-21	15-80	Your reflexes will be affected
21-40	80-160	You'll be paralyzed
40-100	160-300	You'll cease breathing
100+	300+	Death

How can you protect yourself?—*Be careful!* Don't touch any effective ground (e.g., a water pipe, a damp floor, or an electrical outlet) while you work on your electrical system. Keep all AC-powered equipment in safe working condition. Remember, you're more likely to burn yourself than be severely shocked, but neither is desirable.

POWER CONVERSION

With the advent of more powerful electric motors, better batteries, more efficient speed controllers and smaller radio gear, it's possible to convert many power planes to clean, quiet, electric flight.

Ron De Pinto of Fountain Valley, CA, has made an interesting conversion from a Pilot* Piper Tomahawk kit. The kit was originally designed for .25-size glow engines with a wing area of 419 square inches. The all-up weight of the electric version is 4.5 pounds, which yields a wing loading of 24.8 ounces per square foot.

Ron powered the electric Tomahawk with a direct-drive Astro Flight* Cobalt 25 on 14 1250mAh SR* cells turning a Graupner* 9x6 prop. Motor control is accomplished with a Joe Ballasch ESC, which can operate on 1 to 28 cells. Everything is kept under control with an Airtronics* Vanguard 6-channel PCM, two 501 and two 503 servos, and a 250mAh battery pack.

I saw the model fly at Mile Square Park, and it was impressive. The Tomahawk had a takeoff run that was comparable to a similar, scale, glow-powered model. In the air, it had plenty of power, and it seemed to handle the extra weight with little effort. It accomplished basic aerobatic maneuvers without having to dive to gain air speed. When it was time to land, the model had a quick, but steady rate of descent when the throttle was chopped. As a matter of fact, I don't think there would be any problem landing the Tomahawk dead stick.

Converting power planes to electric is fun and very rewarding. If all goes well, Ron will be writing a conversion article on a Pilot Tiger Moth 40 for a future issue. Watch for it!

Till next time...good thermals and a full charge!

"I'm going to fly every Sunday, and my dad is going to buy me some very special airplane sunglasses for flying the airplanes."

I OFTEN HEAR the complaint that there just aren't enough young people involved in our hobby. What with computers, video games and movies, it's difficult to interest them in an activity that takes time, patience and practice. Maybe the problem is that we aren't approaching them when they're really young.

When my daughter Renee was only five, she said that she wanted to learn how to fly. I thought that she was too young, and I told her she would have to wait until she was older. At 5½, she decided she was old enough!

I had just finished the Project Sophisticated Lady, so I decided to let her try thermal soaring. Renee really wanted to learn, and she put a real effort into doing well. On the first flight, she flew for 1½ a minutes without help (other than verbal instructions), and she executed several turns. On the second flight, she flew for almost 3 minutes and actually gained altitude while turning in a thermal. Now, all she talks about is flying on Saturday and Sunday. I have a feeling that within a couple of months, she'll be flying well enough even to try landings. I can't get over her enthusiasm. If your young children show an interest in flying, be sure to encourage them. They're the future of our hobby.

**Here are the addresses of the companies mentioned in this article:*

PacerTechnology/Zap, *9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.*

Graupner, *distributed by Hobby Lobby International, 54614 Franklin Pike Cr., P. O. Box 285, Brentwood, TN.*

Airtronics, Inc., *11 Autry, Irvine, CA 92718.*

Pilot Kits, *distributed by Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728.*

Astro Flight, Inc., *13311 Beach Ave., Marina Del Rey, CA 90292.*

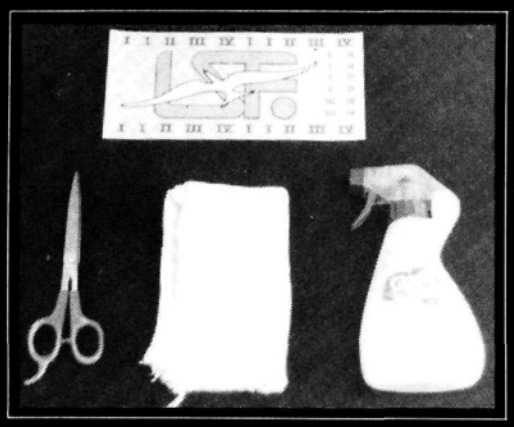
SR Batteries, Inc., *P.O. Box 287, Bellport, NY 11713.* ■

How to Apply Mylar Trim and Decals

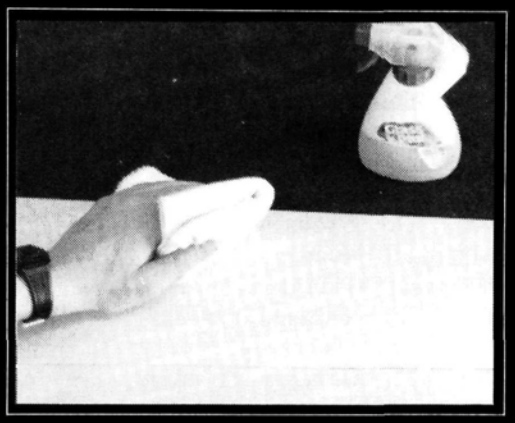
by GEORGE A. VOSS

The answer is in the "solution"

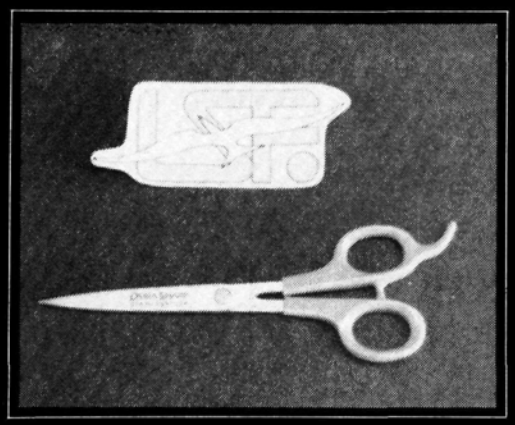
CAN YOU PUT your decals on straight? Are they wrinkle-free, without bubbles? If you have trouble, then the following steps should help. If you trim your airplane with a material that has some built-in sticking power, i.e., Hobby Lobby Superkote, use this method initially to install the trim. When the cleaner has evaporated, iron the covering down just as you usually would. Surprise—no air bubbles!



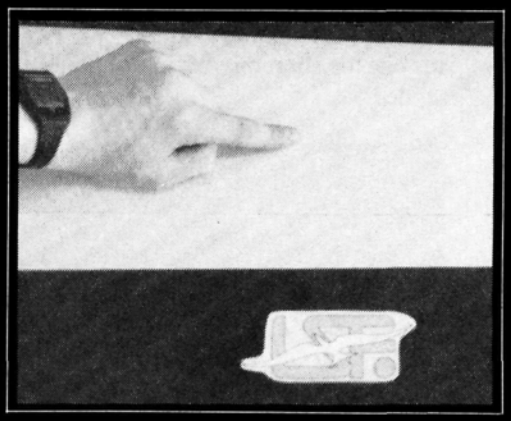
1. You'll need a pair of sharp scissors and/or an X-Acto knife, glass cleaner and a clean, soft cotton cloth. Use soapy water, since the decal rides on the soap film.



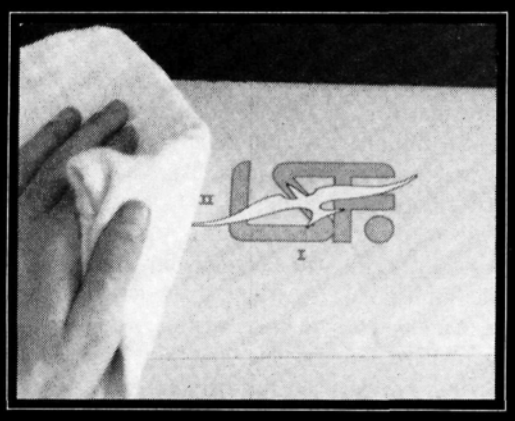
2. Remove any grease, oil or other contaminants from the airplane's surface by wiping it with the glass cleaner and the cloth.



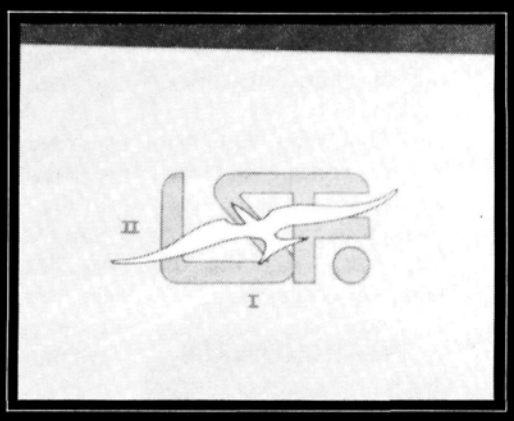
3. Cut out the decal using a pair of scissors or an X-Acto knife. Leave a margin of approximately 1/8 to 3/16 inch around the decals, and be sure to round all the corners!



4. Spray a light mist of window cleaner on the airplane's surface. To ensure that the surface is completely wet, rub the cleaner around with your finger.



5. Position the decal on the wet surface. (The moisture allows you to move the decal around until it's in the desired position.) Once in place, use the cloth to squeegee the cleaner out from under the decal.



6. Don't touch the decal for 24 hours, and voilà—it will be permanently attached. To seal the edges, you may want to spray a coat of clear polyurethane over the decals.

EZ F-16

(Continued from page 33)

ation in servo-mounting location. All the radio equipment is stuffed up into the nose, and everything has its proper location. I'll talk more about the radio installation later.

You've made it this far, and now, the toughest part of assembling the F-16 awaits you. Five major pieces of vacuformed plastic give the model its "slippery" shape. Take the time to pre-fit them properly, and you'll be rewarded with a real "oooh and aaah" result; rush it, and you'll experience frustration levels that will exceed those experienced when paper-training a puppy! The nose cone (radome), canopy, cockpit floor and lower fuselage panel are all removable to allow access to the radio, control linkages and fuel tank. They're held in place with very small sheet-metal screws that are backed by plastic washers, and this system works well. Just remember to reinforce the hole in the fixed part of the fuselage with some scrap sheet plastic. Before gluing the cockpit floor to the canopy, I painted it black and added a DGA* jet-pilot bust for a little more realism.

The next step instructs you to fit the stabilizers, then the engine and the cowling. I reversed this sequence and installed the engine first so that I wouldn't have to work around, and between, the large stabilizer/elevator assemblies. After you fit the cowl to the fuselage, you might think that with the engine/muffler in place, there's not much cowl left. You're right, and you'll probably end up flying without it most of the time, especially if you didn't opt for a three-line fuel system.

There are two problems with the instructions in this section. First, the photos show a modified muffler; its end has been cut off and capped, and two lengths of tubing have apparently been tapped into the body. Good luck! Because the stock muffler won't work in its supplied condition, I modified it by cutting off the end and installing a brass plate in which I had drilled a series of small holes, the total area of which equaled the original exhaust-outlet area. I held the plate in place with a long bolt, lock-washer and nut, and I sealed it with Permatex Hi-Temp silicone. This works well, and it's as quiet as a stocker.

The second problem is that the instructions don't tell you how to hook up the fuel lines. I know, I know—everyone knows how! I just thought it would be nice if they told you! For the one person who doesn't know: the feed line from the tank is connected (via silicone fuel line) to the carburetor, and the vent line to the muffler-pressure tap. The ad did say, "For the experienced modeler," didn't it?!

Install the control linkages and radio next. If you routed the conduits correctly earlier, this should present no problems. The four servos and the battery pack fit under the removable radome, but be advised that flat battery packs won't work; there's a cutout in the "skeleton" that accepts square ones only. I had to trim two of the servo-output arms to prevent them from rubbing against the plastic radome.

The receiver is nestled under the removable cockpit/canopy assembly. I recommend that you pack foam into this area before you slide in the receiver. There's not much of an opening, and you'll have

(Continued on page 65)

EZ F-16

(Continued from page 63)

to "stretch" the plastic away from the ply frame. I mounted the switch in conventional, "through-the-fuselage" fashion on the right side. There's no mention of this in the instructions, but I don't think they expect you to remove the canopy each time you want to turn the system on or off.

You're in the homestretch now: all that's left is the decorating. I used the Mylar "Thunderbird" decals, except for the red-and-blue trim used in the nose area. No matter what I did, I couldn't make the decals fit properly, so I ended up masking and painting. I also painted the lower part of the fuselage to complete the motif begun on the pre-decorated wing panels. I used Cheveron* and Testor's* paint. I don't think you need to use a fuelproof paint because the fuselage isn't really exposed much to fuel.

Finally, balance the plane and check the control throws. The kit now contains instructions that correctly identify the CG location. My kit didn't, but I had an uncomfortable feeling about the recommended location, which was "25mm forward of the fuselage skin seam." That would put it at about 20 percent of the root chord, which, on this highly swept planform, didn't seem right. I started at a point 25mm aft of the seam and added weight to the nose for balance.

TAKING TO THE SKY

Flying the F-16 is exciting, unusual, or, at the very least, different. The plane's pusher configuration gives it some unique quirks of which you should be aware. Regardless of what I did, the O.S. .28FSR didn't run as steadily as I would have liked. It showed a tendency to seem overlean, over-propped or just to overheat. I clipped 1/4 inch off each tip of the prop, re-balanced it and tried again. The overheating was reduced, but not eliminated. I finally removed the cowl to expose more of the engine, and that seemed to do the trick. Even with the O.S.'s cylinder head out in the breeze, though, pushers simply don't cool as well as tractors.

Finally, I had a good, reliable engine run. I started at one end of a 320-foot blacktop runway, advanced the throttle, and the little Falcon accelerated rapidly. At approximately 100 feet, I applied some up-elevator and waited...and waited! It was rolling as fast as it was going to, but still showed no sign of rotating. I came off the throttle just as the plane entered the grass—320 feet away.

My second attempt was almost like the first, but it taught me something; I came off the throttle earlier, the elevator took effect, and the airplane lifted off. That's all it takes—pilot technique! On the third attempt, I came off the throttle and applied up-elevator at the 100-foot mark. The F-16 rotated, I reapplied power, and it was off!

I think this trait can be attributed to the fact that the engine is mounted with some downthrust. At full power, it actually loads the plane's nose downward—a

(Continued on page 74)

A 6-foot-plus electric sailplane ARF with one of the "slickest" fuselages around!

KYOSHO

STRATUS 2000

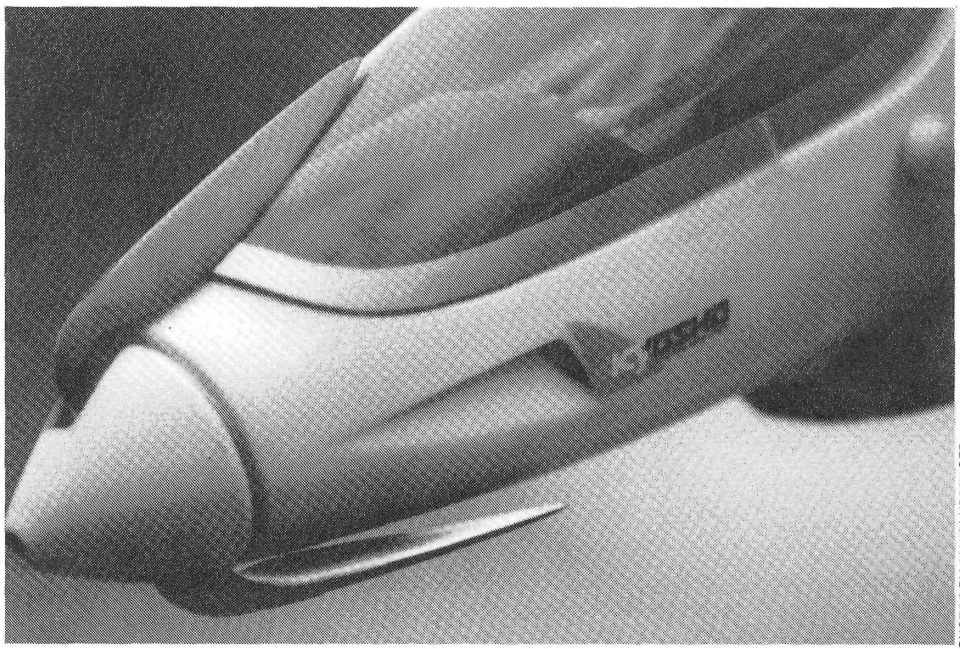
by JOHN LUPPERGER

SPECIFICATIONS

Type: *ARF electric sailplane*
Wingspan: *76.4 inches*
Length: *38 inches*
Wing Area: *552 square inches*
Weight: *44 to 48 ounces (ready-to-fly)*
Wing Loading: *11.4 to 12.5 ounces per square foot*
No. of Channels Req'd: *3 (rudder/elevator/motor control)*
Suggested Retail: *$239.95*
Features: *Blow-molded polypropylene fuselage and pre-built, pre-covered balsa wing and tail surfaces. The direct-drive 550 motor is matched to a folding prop.*
Comments: *A Selig airfoil and Schumann wing contribute to this good-looking electric's performance, which should please even experienced pilots. Because it's difficult to bond anything to the rugged, blow-molded fuselage, mechanical fasteners are used instead of adhesives*

KYOSHO* HAS PRODUCED more successful electric ARFs than any other manufacturer, so whenever they come out with a new model, people take notice. The Stratus 2000 is an electric-motor glider that's designed to operate on a 7.2V or an 8.4V battery pack. To achieve superior climb and a flat glide, it uses the latest Selig 3021 airfoil, and its overall clean design guarantees you long, leisurely, soaring flights. With the help of an instructor, beginners can easily learn to fly the Stratus.

STRATUS 2000



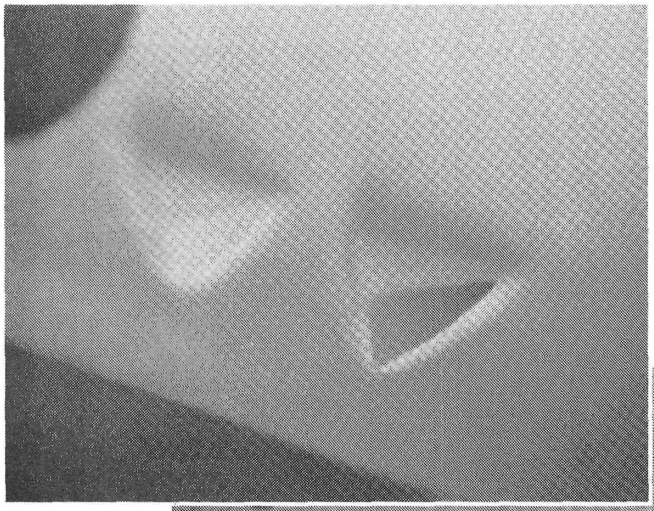
PHOTOS BY JOHN LUPPERGER

THE KIT

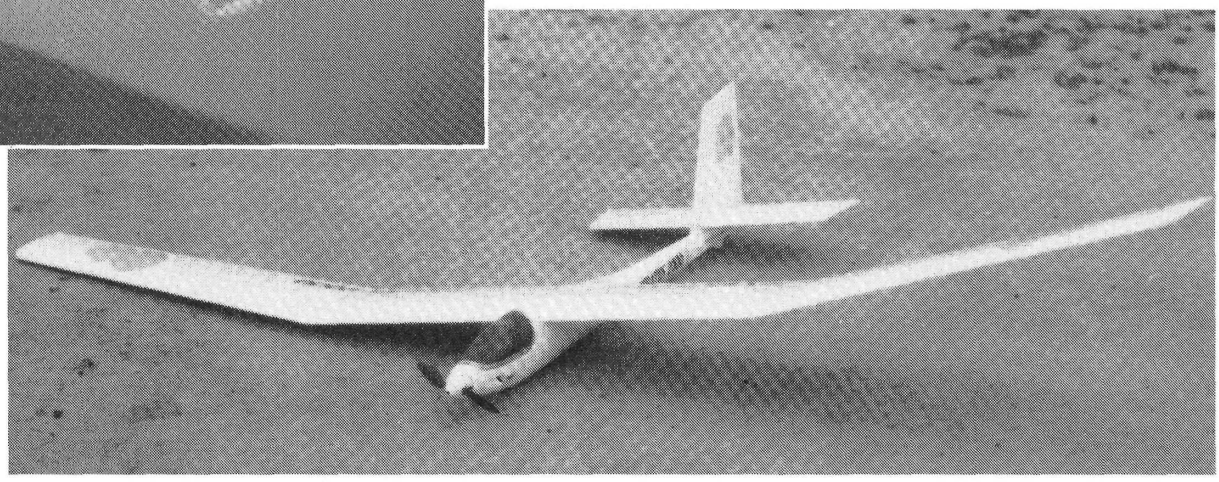
The kit arrived in good condition: a cardboard separator protects the fuselage and built-up parts; the balsa, D-tubed, covered wing and the tail surfaces are wrapped in plastic and bubble pack; and the hardware, prop and motor come in two separate boxes. Every piece of hardware you'll need is included, and the Kyosho 7x3 scimitar folding prop comes with a backplate and spinner.

The AP36L is a modular 550-type motor with replaceable brushes, and it can be hopped-up with speed accessories that are usually used on R/C cars. The fuselage is made of nearly unbreakable LSS plastic, and it has a smoked-finish canopy complete with pilot figure. Isometric drawings in the 12-page instruction manual illustrate each phase of assembly (including radio installation), and the supplied, colorful Mylar transfers add the finishing touches

The prop folds back and follows the contour of the fuselage, and this greatly reduces parasitic drag in the glide.



For more efficient operation, exit holes in fuselage allow warm air to escape and keep batteries and ESC cool.



The Stratus 2000 is a nice-looking model with good proportions. The generous tail volume adds to its stability.

CONSTRUCTION "STRAT"-EGIES

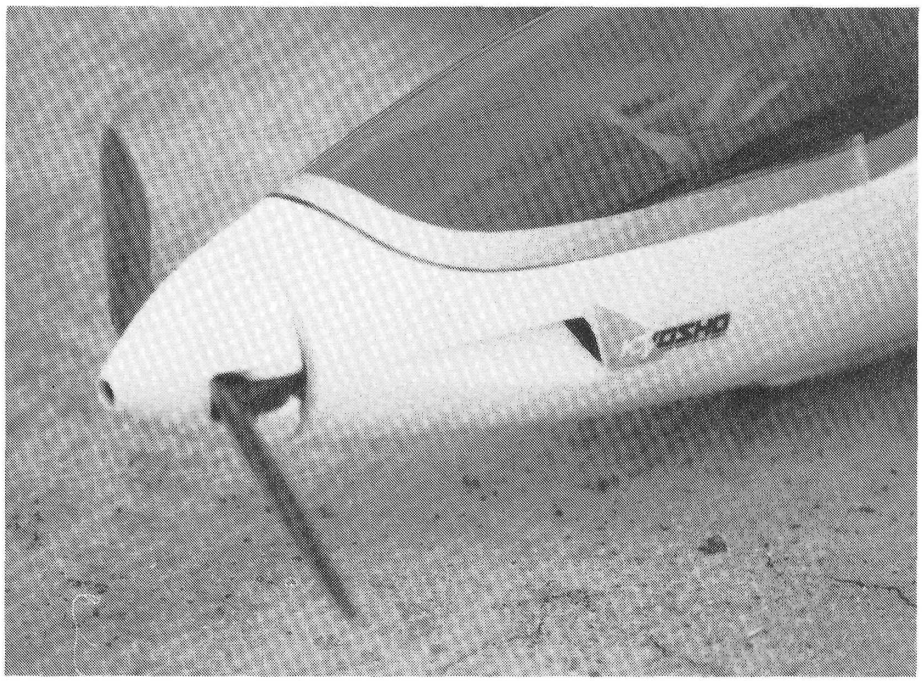
There's no full-size plan (as all the airframe components are pre-built), but the manual shows you how to prepare your model for flight.

First, cut all the necessary openings in the fuselage (canopy area, air scoops and pushrod exits) and remove the small amount of mold flash. Screw the wing-mount and skid-plate hardware into the fuselage. (Note that everything is screwed or bolted on, because the LSS fuselage seems to resist all adhesives.) Using the supplied die-cut lite-ply and nylon hardware, construct the servo tray and battery holder and screw them into place. (The die-cutting was excellent; the parts literally fell from the sheet!) Now mount the motor. A metal, motor-mounting plate goes on the outside of the fuselage, and screws pass

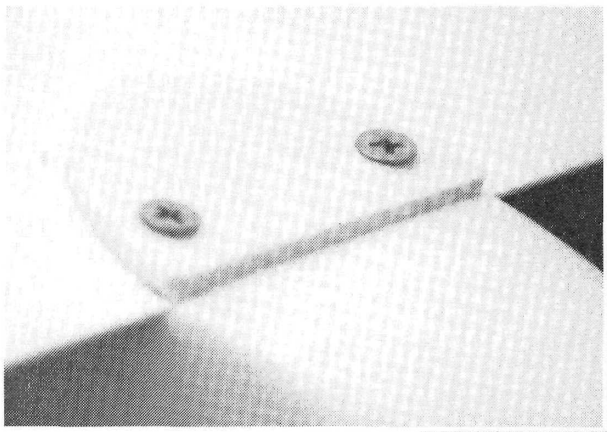
through it into the motor. This strengthens the front of the fuselage and helps it to carry the load.

Prepare the tail surfaces to be attached to the fuselage. Cut the plastic tips for the stab and fin from the vacuformed sheet, trim to fit and attach with thin, double-sided tape. (When I tried to do this, the tips always stuck down before I could get them where I wanted! I finally gave up and glued them with Zap* CA.)

Cut a notch in the inside of each elevator half, and epoxy the metal joiner into place. Drill the stab to accept the two threaded rods that protrude from the bottom of the fin, and place it on the fuselage. A nylon support plate is screwed onto the top of the stab, and the fin bolts pass through it into the rear of the fuselage. Two nylon caps, which screw up from the bottom of the fuselage, hold the whole assembly securely in place. When everything is in position, tape-hinge the rudder to the fin, mount the control horns and fit the pushrods with clevises.

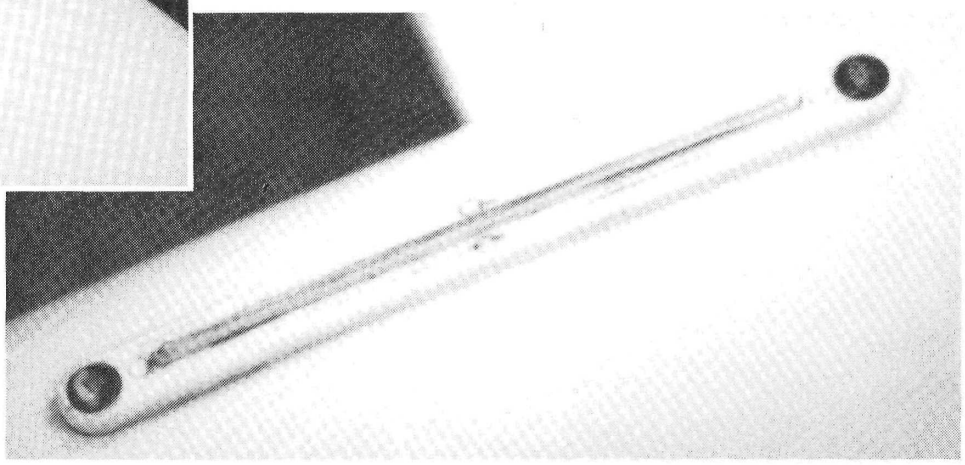


The scimitar prop and its backplate-spinner unit blend nicely with the shape of the Stratus' front end.



Plywood plate protects the wing's trailing edge from being crushed when you tighten the twin wing bolts.

Next, prepare the wing center panel for mounting. The metal hold-down pin must be inserted through a hole that's exactly in the center of the panel's leading edge. Position the reinforcing plate for the hold-down bolts, glue it to the trailing edge, and drill the wing-bolt holes. Trim the forward wing center cover from its plastic sheet and apply it with thin, double-sided tape. Do the same thing with the the wing tips. (I used Zap to attach these.)



Like everything else that's attached to the LSS fuselage, the skid is mounted with two screws. The fuselage resists adhesives.

For flying, the outer panels and center section are joined with pre-bent wing wires that fit into tubes in both sections. Unfortunately, the wire-to-tube fit is loose. Cover the joint where the outer and root panels meet with a strip of clear Mylar so that the covering won't pull off when you tape the tips in place. The three-piece wing breaks down into sections, so it's easy to transport.

Trim and paint the canopy and pilot tray, and join them with double-sided tape. (With a friend spreading the canopy, the tape worked well here). The tray is secured to the fuselage with two screws that should stick up slightly; their heads slide into notches in the tray's bottom and lock it in place. This holds the canopy tightly, but it can be removed quickly and easily for access to the radio.

(Continued on page 81)

EZ F-16

(Continued from page 65)

force that the elevator has difficulty overcoming. When you reduce power, the nose downloading is also reduced, and this allows the available elevator power to work.

Once airborne, the plane flies smoothly, but I thought the recommended aileron throws were a little too sensitive. If you have a dual-rate radio, set the "low" rate to approximately 70 percent of the recommended value. Considering that there's only a .28 in this little machine, it really goes! It rolls rapidly and is very fast. Landings must be performed carefully, just like takeoffs, because there isn't much difference between the airplane's static "deck angle" and the angle at which the prop-protecting tail skid hits the ground. Approaches are necessarily flat, which usually means "hot!"

What has Sports Aviation given us in this little hot rod?—a slick-looking, colorful model of a popular airplane; the chance to fly a "jet" without having to get into ducted fans (although the control effectiveness is similar: owing to the lack of prop blast over the surfaces, sufficient air speed must be achieved before the controls can become effective); and the opportunity to do a little "building" on what's considered an ARF.

This isn't a middle-of-the-road airplane. Its characteristics (or peculiarities) will cause you to love it or leave it in the hangar. Like climbing into a waterbed for the first time, the F-16 can be a lot of fun—if you take the time to become comfortable with it. They did say "for the experienced modeler," didn't they?!

(Continued on page 81)

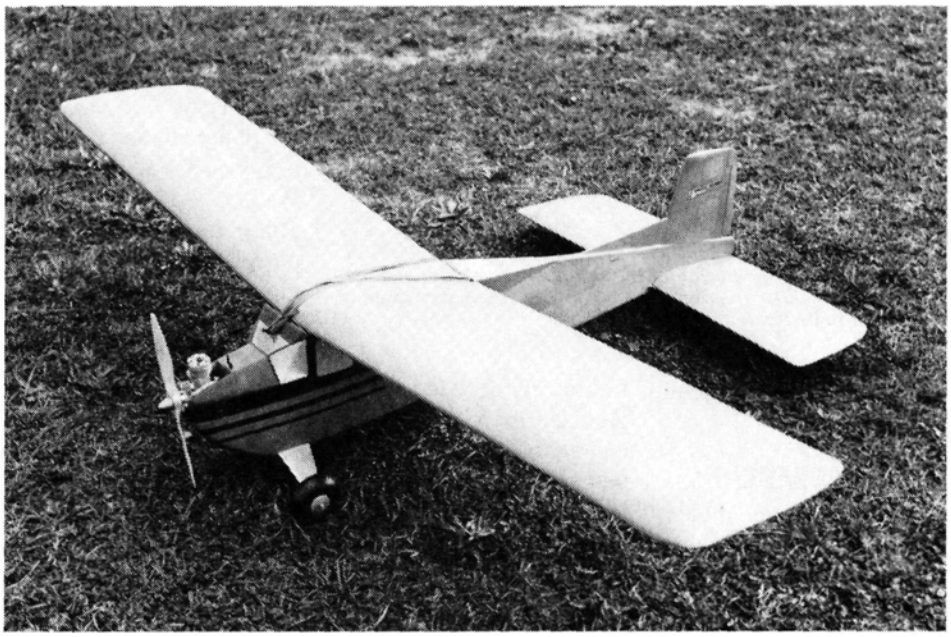
GOLDEN AGE

OF RADIO CONTROL

by HAL deBOLT

Return With Us Now...

SELINSGROVE? What's that? If you read a recent Vintage R/C Society newsletter, you'll know that one of the group's main activities for 1990 will be a "Selinsgrove re-enactment," but you might be wondering what it is. Today, we have so many events—the Circus Circus Tournament of Champions, Scale Masters and the recent Top Gun Invitational are the most prestigious. The R/C world has always had "gatherings of gods," and Selinsgrove is perhaps comparable to the Toledo or WRAM shows; in the early '50s, it was an annual event.



George Swank's Live Wire—the very first of the breed—had KSB .19 power, 465 C-S radio and rudder only. George demonstrated it at an early Selinsgrove gathering, and it was later kitted as the LW Senior.

SELINSGROVE SOUVENIR

I've long wanted to write about Selinsgrove, but I haven't been able to find photos and/or pertinent information, so if you know anything about it, please let me know.

The VR/CS 1990 re-enactment will be held on the event's traditional weekend and at the original site, and the program will feature OTR/C from the '50s. "Rudder only" was dominant then, so there probably won't be much "hot-dog" flying. Rudimentary multi might enter the picture, but you won't see any "full-house" flight. To round out the program, models of the more recent past are welcome, but the emphasis will be on sport and leisure planes. If you're interested in OTR/C, don't miss this event.

To whet your appetite and give you some idea of what to expect, here's an account of my Selinsgrove adventure.

THE BACKGROUND

In the early '50s, R/C activities were mostly local; there were "hot spots" around the country, but no national event to bring people together. There were few manufacturers, and everyone was searching for the "right stuff."

Leading centers of R/C activity were in California, New Jersey, Washington and around Pittsburgh, and there was communication between these areas. The idea of gathering to see what others were doing was appealing, and members of the ARCS Club of Pittsburgh were the main movers.

The small farming community of Selinsgrove, PA, was central to most eastern R/C activity, and one ARCS member had a relative or friend who owned a full-scale, grass air strip there. With a main north-south highway, motels and restaurants close by, it seemed an ideal location. The first gathering was of a few families over a Labor Day weekend, and the next couple of years saw it grow into a substantial meet. For R/C-ers, Selinsgrove became the place to be.

My introduction to Selinsgrove was through a phone call from an enthusiastic Jim Walker who was on his way there through Buffalo. Too many wanted to attend, so participation was already by "invitation only," but Jim's vivid description encouraged me to wangle an invitation. The event turned out to be unforgettable!

George Swank and I had only a summer's experience flying our Citizenship 465 and K&B .19-equipped Live Wires (which hadn't yet been kitted as the "Senior"), and I also had the prototype Trainer with 465 and a Mills .08 diesel. We

GOLDEN AGE OF R/C

were both fairly successful, but were awed by the magazine stories about what the "experts" were doing. You can imagine our anxiety as we anticipated meeting these people and seeing them fly!

Antique R/C by unknown builder. This is typical of the designs at early Selinsgrove. Note the folded dipole antenna on the 465 transmitter, which had to be pointed at the model. There was even a neon power indicator.

R/C GABFEST!

Our Selinsgrove motel was filled with R/Cers, all doing their best to explain their latest concoctions. To "pulse" or not to pulse seemed to be the main dilemma, and many discussed the theory that "audio tone" would be the system of the future. Walt Good expounded the virtues of rechargeable "silver-cell" batteries, which seemed to have as many shortcomings as attributes. Ni-Cds were way over the horizon, and dry cells were our undoing too often. As you'd expect, with our heads full of R/C jargon, sleep didn't come easily that night; and the next day promised to be great!

After breakfast, we headed to the airstrip—a rough-cut grass strip that was lined with vehicles. The scene was a surprise; we expected a sky full of models and all we saw flying was a child's Jim Walker glider! There was a group tinkering with their models at the far end of the runway, and we could see much excited arm waving, etc., which proved to be a mass "tuning session."

As newcomers to R/C and 465-oriented, all this preflight was a learning experience for us. In bold letters, our radios' instructions stated, *"Do not attempt to tune this radio!"* Dare we ignore this?—sure, everyone else seemed to be! We surveyed the gathering and noted the presence of the "gods"—Good, Lorenz, McEntee, Schmeadig, Northrop, Collins, McElwee, Granieri, Hill and so many others. What a wonderful experience!

SOARING AT SELINSGROVE

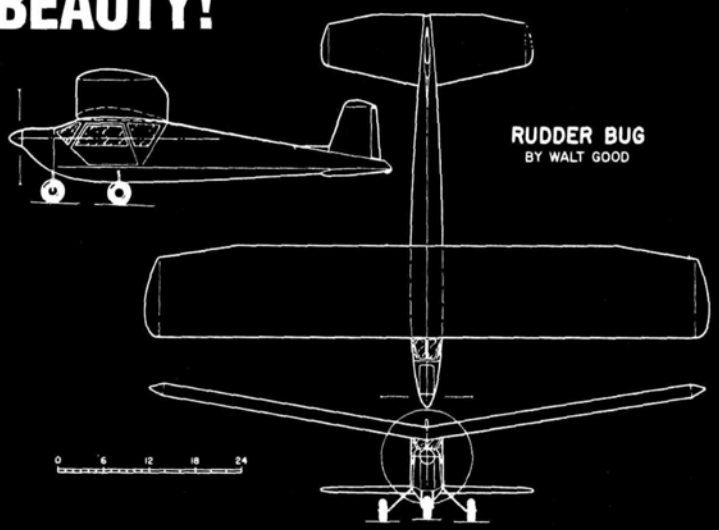
There was a sprinkling of McElwee designs from the Jersey area, some Berkeley Brigadiers and Buccaneers and many originals of apparent free-flight lineage, but there were more of Walt Good's Rudder Bugs than any other type of plane (see sidebar for details).

George and I were soon

BUG BEAUTY!

At Selinsgrove, we saw the beginning of today's R/C designs. The first step toward true R/C design was probably Walt Good's famous Rudder Bug, and there were more of them than any other plane at early Selinsgrove meets. Fran McElwee's Radart, which is shown in the second three-view, is typical of the other designs seen at those meetings. Perhaps we'll see replicas of both at the 1990 re-enactment.

How Walt met the needs of R/Cers with this break from free-flight philosophy is interesting and shows how this OT design can be used today.



Rudder Bug three-view. (Three-views by Paul Plecan.)

First, think about flight requirements and what was available:

- Equipment was large, heavy and required constant attention.
- The single yaw control wasn't instantaneous, and you could easily go in the wrong direction before getting the one you wanted. Flights and landings could be erratic, and a realistic goal was to fly a few times between repairs.

Note the Bug's generous wing area, high-lift airfoil to carry the heavy load and large R/C compartment with "side doors" for easy access to the radio and batteries. Equipment dictated airplane design so much in those early days!

The Bug was a large, relatively heavy model, but it flew with only a .29 so that flight speeds were restricted and fliers would have time to *think* and assume proper control. Response wasn't as fast as it is now.

The trike gear looks modern, but its design was quite different. The nose-mounted third wheel was used mainly to protect the precious engine and prop!

Walt took liberties

itching to get airborne with our 465s (the only ones there), even though the R/C fraternity frowned on them because they weren't home-built. We were like Cessnas at a Fly Baby convention! Remember, with rudder only, the top priority was always to fly "upwind" so that if the radio malfunctioned (which was probable), the model would drift toward you.

We gassed up, started our engines and launched. Being timid, our inclination was to fly straight upwind, because a failure in this prestigious company would be really humiliating! The Live Wire became a dot in the distance, and, obviously hoping to help, one of the experts came over to ask the then-inevitable question: "Have ya got it?" We were happy that, even if nothing else, we showed everyone the ability of MacNabb's 465 equipment.

That weekend, we flew, absorbed the latest R/C information and watched the "big names" do their thing. With the re-enactment, I hope to see some of the airplanes again, and I'm anticipating the same wonderful atmosphere.

Walt Good's Rudder Bug. Walt not only designed the plane, but he also developed and built the radio. Note the auxiliary battery for the transmitter and the large box for the single control lever.

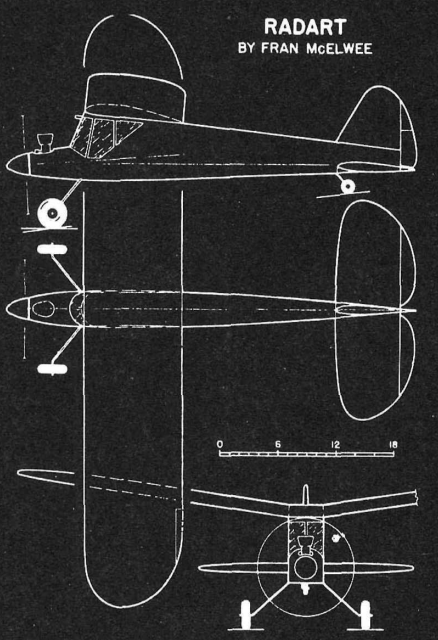
The Selinsgrove event was later moved to Indiantown Gap, and, by that time, much of the mystique of R/C had vanished. "The Gap" soon became what could have been the first of the modern-style fun flys.

For information about the 1990 Selinsgrove Re-enactment, contact John Worth, 4326 Andes Dr., Fairfax, VA 22030. I hope you'll be there to see some real old-time-type talent! ■

with aerodynamics. The Bug's aft side was designed to enhance lateral stability. This was actually guided free flight: the model flew itself; you steered. You needed positive spiraling stability! To reduce any climbing tendency, the high thrust line was close to the center of resistance. Bug aerodynamics marked a major step forward and definitely influenced the R/C designs that came later.

The Bug's structure was of free-flight origin and used classic stick-and-tissue methods, but it was much more rugged so that it could tolerate the rigors of early rudder-only flying. With the exception of its thrust line, its resembled Fran McElwee's Radart. (Fran had to use a lot of downthrust to accomplish the same purpose as Walt's high thrust line.)

Do any designs from the antique R/C era look nicer or perform better than these two?

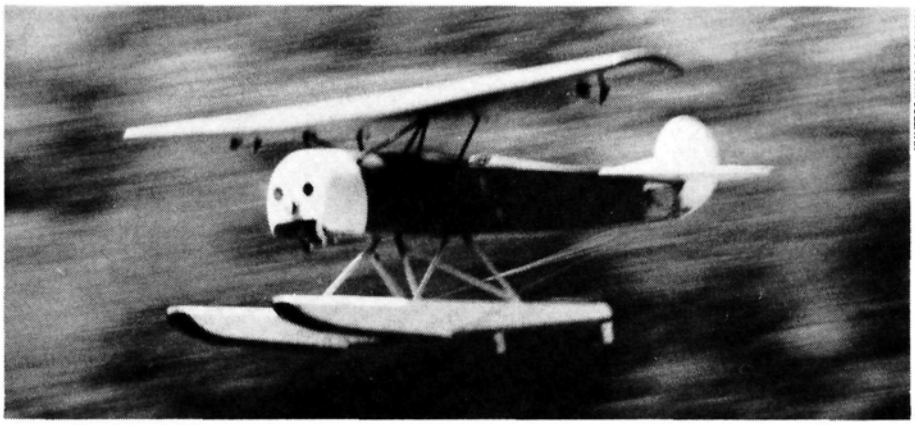


Radart three-view.

FLOATING AROUND

THREE FLOATPLANE REVIEWS...AND MORE!

by JOHN SULLIVAN



PHOTOS BY JOHN SULLIVAN

Jerry Sleight's Fokker D VIII on the move! Water rudders are actuated from air rudder by a Bollard-cable setup.

FLOATPLANE REVIEWS

I'll review three floatplanes this month—all with a history. I know very little about the original Gere Sport Bipe—only that the kit modeled by Fred Constantine was made by Airtronics and is currently out of production. Fred spotted the kit at a swap meet, and since he had always wanted one, he snapped it up. This little floater has a 42-inch top span and a 34-inch bottom span. Fred modified it to carry an Astro Flight Cobalt 15 with 12 Sanyo 900mAh SCRs. The Astro swings an 8x4 Graupner old-timer prop from Hobby Lobby, and Fred says it's the best prop he's ever had on the motor.

The Gere Sport's wings are covered with MonoKote, and the fuselage, with tissue and dope. The 28-inch, foam, Sullivan floats were "stringered" with 1/16x3/8-inch balsa strips and then covered with MonoKote. The stringer/MonoKote system produces one of the lightest pair of floats I've seen, so it's a method worth looking into—especially for electrics, where weight is always a consideration. Fred originally had a 3/8-inch strip across the step bottom, but this caused the formation of a lip across the step when the oncoming water depressed the MonoKote, and this, in turn, made the Bipe ride on its nose in the water. Fred solved the problem by "planking" the rear two-thirds of the rocker area and covering that portion of the bottom with MonoKote again.

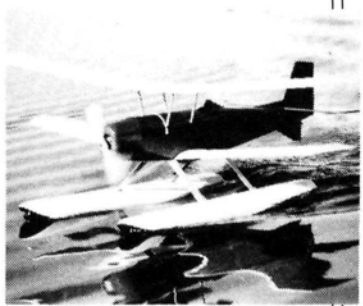
Mike Johnson, Jack Kostelic and Jerry Sleight hustle Sleight's Fokker D VIII down to the water. Launching giant-scale floatplanes takes extra hands!

Even with careful building, the Gere Sport came in at 4 pounds, and it sports an excellent 16-ounce wing loading. This quiet little Bipe charges right off, breaks water with plenty of power and flies as fast as a gas job of the same size. The 12 cells and Jomar SC4 speed controller give Fred 4 1/2-minute flights with ample time to taxi in. This is a delightful combination, and I hope some of you will now rummage through your collection of old stick-and-tissue kits. Fred has a stay-clean, trouble-free winner!

FOKKER ON FLOATS

At the lake a couple of Sundays ago, I was amazed to see a Fokker D VIII on floats. This, the last of Anthony Fokker's WW I designs—and, I think, the first cantilevered monoplane—comes from the ever-crowded building board of Jerry Sleight of Sausalito, CA.

This is a *big* airplane: it spans 102 inches, weighs 24 pounds and gets its power from a Zenoah G62 swinging a 20x10 Dynathrust prop. Jerry tries to be "contrary," but can't help being likeable, and this characteristic is shown in his building approach to the Fokker: he started by taking the aircraft's outline from Bill Wendt plans, changed everything inside and still came up with the Charisma Floatplane Award for 1990.



Fred Constantine's Gere Sport Electric taxies back to shore. Note sub fin supporting water-rudder shaft and standing antenna.

The D VIII is covered with red and white Coverite Permagloss, and it sports a

(Continued on page 82)

EZ F-16

(Continued from page 75)

**Here are the addresses of the companies mentioned in this article:*
Sports Aviation, *distributed by Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728.*
DGA Designs, *135 E. Main St., Phelps, NY 14532.*
Cheveron Hobby Products, *P.O. Box 2480, Sandusky, OH 44870.*
Testor Corp., *620 Buckbee St., Rockford, IL 61104.* ■

KYOSHO STRATUS

(Continued from page 70)

The scimitar folding prop greatly enhances the Stratus' performance. The two blades are held onto the backplate by two roll pins; the spinner is put on; and the entire assembly is attached to the motor shaft by an adapter with a setscrew.

Apply the supplied Mylar graphics, and you're ready to fly! Because the entire model is white, trim material can be added to give it a personalized look. I've had several Kyosho ARFs, and my only complaint about the Stratus is that the assembly book isn't detailed enough, and beginners might have trouble figuring out some of the steps. The drawings are good, but additional written instructions would be helpful.

(Continued on page 84)

FLOATING AROUND

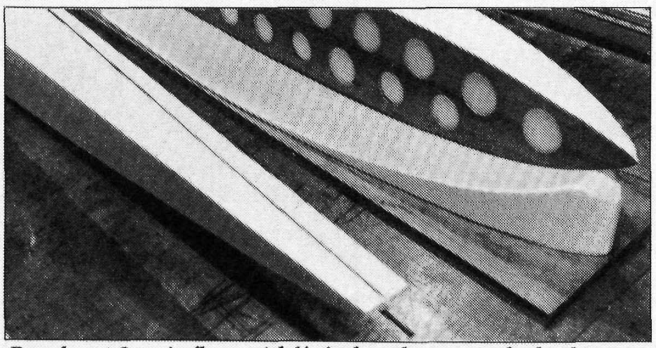
pair of 52-inch epoxy/glass-and-foam floats that were cut following a plan shown in the September '87 issue of *MAN*. The float struts and cabanes are fiberglass arrow shafts paired with 3/16-inch dowels and wrapped in fiberglass to achieve their tapered form. The strut ends finish with threaded-rod extensions that are epoxied into the float and fuselage hardpoint blocks.

The Fokker taxies and flies straight and true, but it takes a lot of raw power to get it going and keep it that way. I've watched Jack Kostelic abort a D VIII landing and hang its entire 24 pounds on the prop for what seemed like an eternity, but I wouldn't want to try it. The Fokker was at Clearlake '90, and I'll try to show a good color shot of it in my report on that meet. Meanwhile, if you want to terrorize your local ducks, consider this monster as your next project.

SCHNEIDER CORNER

THANKS, *MAN!* Bob Martin, Schneider Cup Re-enactment Chairman, called to thank *Model Airplane News* for its coverage of the Schneider Race, and he also said that the event's organization has been transformed. For 1990, he will lead a new group—the Schneider Cup Association—while the Desert Hawks, who put on one of the best meets I've *ever* attended, will be the host club. Bob didn't say so, but I think this arrangement will enable the Association to hold qualifying meets like the Scale Masters all over the country (or the world, for that matter), with the grand finale each year at Lake Havasu, AZ. I'm just speculating, but they don't have small thoughts in Havasu, and who knows?

Bob also told me that Thomas Foxworth's "The Speed Seekers" is back in print. This fantastic book discusses the Schneider and other historical racing events (the men and the machines they flew), so check your local book store. Bob asked me to send Foxworth a copy of my Schneider video so that he could see modeling's efforts to revive this classic.

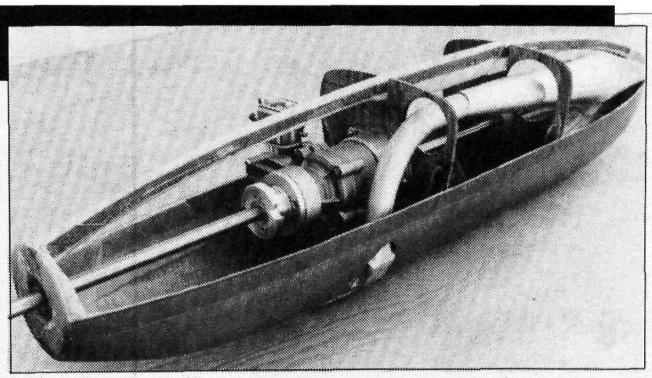


Rough-cut Savoia float with 1/8-inch mahogany web glued to center-cut wall. Foreground: note rubber tube embedded in companion float half.

SCHNEIDER SAVOIA

Mike Johnson has the pan laid up for our Savoia-Marchetti M65. Last time, I showed you the mold; this time, there's a shot of the pan complete with two main bulkheads, Kevlar and carbon-fiber bearing races, drill rod shafts, a top brace and the Zenoah G62 with remote carb and homemade tuned pipe.

Mike laid the pan up with tinted epoxy gel-coat followed by one layer of 2-ounce glass-cloth, three layers of 5-ounce Kevlar and carbon-fiber reinforcement. The bare pan



Mike Johnson's belly pan for the Savoia nears completion. Note remote carb and homemade tuned pipe for the Zenoah G62; head cut-out is barely visible.

weighs 1 1/2 pounds and is unbelievably strong. We burned up two Dremel cut-off wheels while cutting out the cylinder-head opening!

As you might have noticed, Mike has abandoned the idea of putting a cooling fan on the forward shaft. Instead, he ground the G62 fins down to conform to the pan's bottom profile, and we're hoping the prop blast will prevent things from melting. Mike is busy machining U-joints, thrust washers, threaded collars and some other simple stuff (I'm glad I have this guy for a partner!), and by the time you read this, we'll have demonstrated the unit at Clearlake (I hope!).

Meanwhile, I have to make the floats. The photo shows one of them after the top and side profiles had been cut out of the Styrofoam plug I started with. The 5- to 7 1/2-inch-long floats get their strength from a full-depth, 1/8-inch, mahogany ply web (which you see drilled with lightening holes in the photo) and a carbon-fiber/Kevlar/epoxy skin. The main pod, the wings, the booms, and even the empennage are all braced or guy-wired to the floats on the Savoia, so they have to be strong. I've been taking shots of the floats as I make them, and I plan to write a detailed construction article about them for the annual floatplane issue in October. Given the complexity of the Savoia floats (with internal rudder servos, and all), I hope that my step-by-step article will help those contemplating their first float project.

Construction reports on new Schneider entries are coming in. This year, there may be as many as five Curtiss R3C-2s, and there's also talk of an all-out "grudge race" for speed on Sunday afternoon. There are also rumors of Classic Coke sponsoring the event with ESPN coverage! Don't wait for this one to go by; November 2, 3 and 4 will be here before you know it!

JIMMY'S ROBINHOOD

Long-time readers of this column will remember Jimmy MacDanald who started flying R/C several years ago with a Craft-Air Butterfly and has plowed through quite a few projects since then. His planes are all still flying, but Jimmy has found an all-time favorite—the World Engines Robinhood 80.

The Robinhood is easy to build, flies solidly and has become popular among land- and water-based fliers. It's a light flier with well-balanced responses, and it typically comes in at less than 12 pounds with floats. Add the charisma of the Curtiss-Robin, which fostered this plane's good looks, and you have a really great airplane that few, if any, can fault.

Jimmy's Robinhood is powered by an O.S. 90 Surpass swinging a 14x6 Master Airscrew prop. The plane is covered with cream and maroon MonoKote, and, in the air, it looks as if it flew right out of the '30s. Jimmy epoxy-glassed a pair of 44-inch Sullivan floats and made the "N" strut gear from 1/8-inch music wire painted black. The Robinhood rudder system is straight out of the '89 float issue, and it steers the plane in any crosswind in which you'd dare to taxi around.

MacDanald's Robinhood 80 wings off into the '30s. This 13½-pound floatplane has MonoKote covering and epoxy-glassed Sullivan floats.

Apart from the required trainer attributes, e.g., easy to build, forgiving flight characteristics, etc., it has a more intangible quality: it doesn't intimidate beginners. (Some have it; some don't!) I might be exaggerating slightly if I suggest that the Robinhood is an all-out trainer, but it certainly qualifies as the next step up. Jimmy is already building a Robinhood 99 for his new Zenoah G38 and, yes, that will be a floatplane, too.

Jimmy MacDanald cranks the O.S. 90 Surpass on his Robinhood 80 while Dick Lemme holds the throttle. Note stick-and-carpet float cradle for beach prep work.

Time to wade off. I'll be attending the Lakeland Sun and Fun Full-Scale Fly-In in Florida soon and hope to have a report on what's billed as the "largest seaplane meet." Deploy those oars, and I'll see you in a couple of months.

**Here's the address that's pertinent to this article:*
***Ronald Ogren Float Plans,** 6116 Armor Rd., Orchard Park, NY 14127.* ■

THE FLOATING MAILBAG

I've received a couple of letters from Marvin Combs of Edmonton, Alberta, Canada. He has a remarkable ability to describe the beauty of his country, its people and particularly the escapades of bush pilots—past and present. These guys are *wild!* Marvin tells great stories about batches of bad radios, many crashes, nearly fatal injuries and pilots who still go back for more.

I've also received a sample plan of a 32-inch built-up float by Ron Ogren* of Orchard Park, NY. Ron calls it his "Seazy Float," which seems easy to build and has a very pleasing shape. He complained mildly about the number of times Sullivan floats have been mentioned in this column, and his complaint is understandable. Over the years, I've reviewed every float except the new Stream and Byron Floats (which I'll discuss in a future column), but there *are* a lot of Sullivan floats in there.

My problem is that many floatplane reviews are the results of activities at my local lake, and the fliers I meet there find it convenient to call and ask me to "bring another pair to the lake on Sunday." The solution to this inequity is for more of you to send photos of your projects. Float flying is just too much fun to keep anyone—modeler or manufacturer—out of the picture. We're all promoting a hobby we thoroughly enjoy.

Think back a few years to when the Gorhams were writing helicopter columns and Curtis Hutchings wrote about R/C cars. Both found something they liked, wrote about it, and sold many helicopters and cars. Today, it would be difficult to count all the car and helicopter manufacturers, and each sport has grown to a point where it has its own magazine or special coverage. You can bet that no one, from hobby shop owners to catalogue firms to competing manufacturers, is unhappy with the efforts of Gorham or Hutchings.

KYOSHO STRATUS

(Continued from page 81)

RADIO INSTALLATION

I used a Cirrus* 5 PCM with KO Propo* S-51 miniservos and a Novak* T-1 Tempfet ESC. To help reduce the plane's weight, I chose a 250mAh airborne battery. By shifting the gear around slightly, you can achieve proper balance without adding ballast. I mounted the servos at the rear of the servo/battery tray; the airborne battery and receiver both slid underneath; and the ESC fit under the canopy directly behind the motor.

UP INTO THE "STRATUS"-PHERE!

For the first flight, I tried a 7.2V 1200mAh battery pack. If the Stratus performed well on only six cells, I knew it would be a winner on seven! I pointed the Stratus into the wind, advanced the throttle and let it go. The plane went straight out and up, at a moderate rate of climb. It wasn't a rocket, but it was definitely solid, and it reached thermalling altitude in just under a minute.

I checked the Stratus' turning ability and stall characteristics. With power on, it stalled straight ahead with only a slight tendency to drop the left wing. In the glide, the model held a very high angle of attack, and the subsequent stall was also straight ahead. The Stratus moves quickly, probably owing to the relatively thin Selig 3021 airfoil. It carries this speed nicely when turning and really holds a line, so you can work small thermals without any fear of tip-stalling. Even when I slowed

(Continued on page 87)

ABOUT THOSE ENGINES

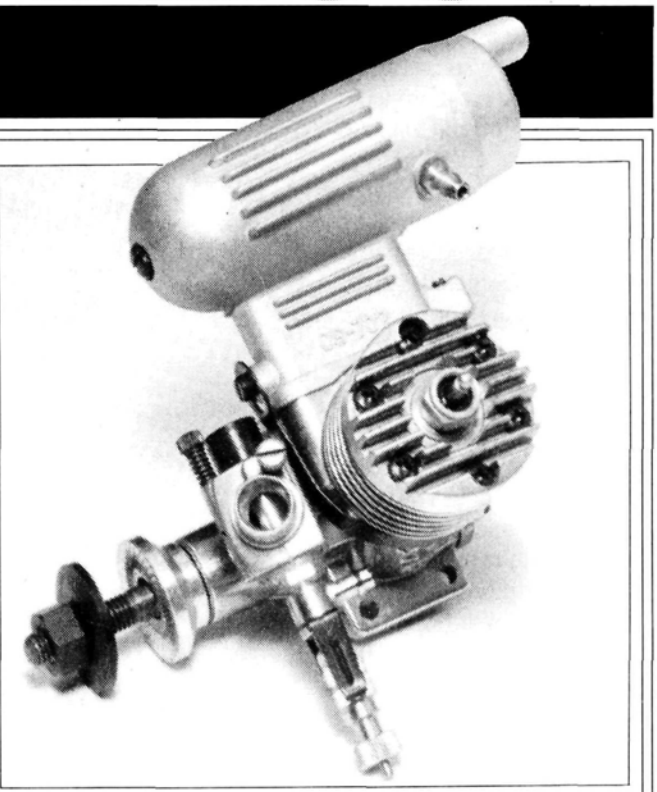
by JOE WAGNER

Does quality inhibit understanding?

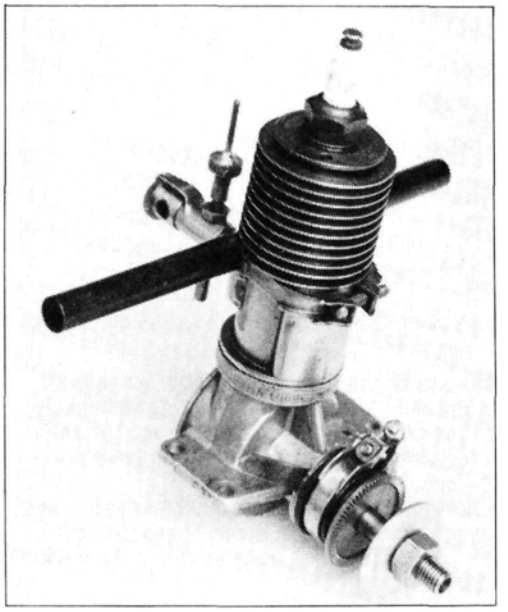
THOUGH IT SEEMS paradoxical, I think that some of the trouble we have with our R/C engines is caused by their exceptionally high quality! Why? Because model airplane engines in general have become so reliable that we now take them too much for granted.

An R/C flier no longer needs to understand how and why his engines work. He can take a new motor out of its box, mount it in an airplane and fly it—all season, if he wants. Electric starters make it relatively easy to start even a balky motor, and an engine with several things wrong is often quite capable of pulling an R/C airplane through the sky, flight after flight.

Eventually, of course, such a motor will fail; and when it does, its owner can't figure out why. A while ago, a local flier asked me to check his Super Tigre because "It just doesn't have the power it used to." When I disassembled it, I couldn't understand how it was able to run at all! It looked as though that Super Tigre had been given no attention whatsoever after it had been mounted in an airplane. Several head screws had loosened—three of them so much that the head gasket had become unseated, and carbon coated everything in that area. Residue from evaporated fuel covered much of the case interior, and the ball bearing would hardly rotate. Yet, before I took that Super Tigre apart, it was still capable of running at least well enough to fly an R/C model. It didn't perform *well*—but it *did* run!



Coarse-thread adjustment screws can make setting an air-bleed carb (like the one on this O.S. .15) rather tricky—especially if you're trying for the ultimate speed range!



Early model engines like this 1937 Brown needed a lot of maintenance and understanding to keep it running.

Had this Super Tigre been less well designed and built and less powerful, it would have failed long before it reached the sad state just described. Many of yesteryear's model motors simply refused to run if any significant fault arose, so their owners had to learn the operating principles of 2-stroke engines, and routine maintenance was standard practice for most model fliers.

Times have changed! During the last three years, I've twice taken an R/C motor that had been discarded by its owner because "it's no good any more," and, with relatively little work, restored it to a nearly new condition. To one of these fliers, I tried to explain the cause of his engine problem and how he could avoid it, but he wasn't interested. He didn't want to bother with his R/C motors; if one of them didn't run, he tossed it out and bought a new one!

NEEDLE TWIDDLING

At flying fields, I too often see engines that had previously been performing well suddenly becoming balky; it's needle-twiddling time! The owner usually won't accept the obvious, i.e., that something must have gone wrong. He adjusts and readjusts his

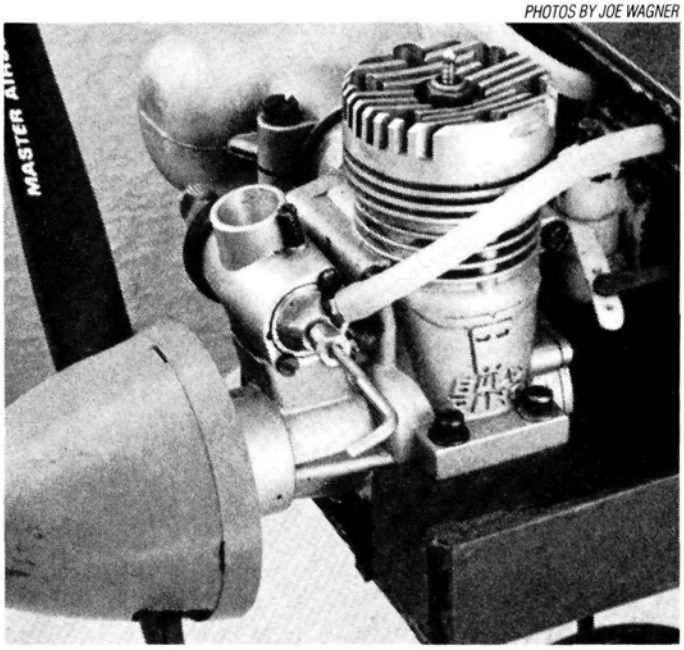
ABOUT ENGINES

needle valve (apparently hoping for a minor miracle) rather than systematically checking the most probable sources of trouble: a bad glow plug, plug battery, connector, or wiring; and a faulty fuel supply caused by cracked or clogged tubing, old or contaminated fuel, or a damaged tank or fittings.

Another reason for needle-twiddling is the never-satisfied desire of too many fliers for a higher peak rpm and a lower idle. No matter how fast a motor revs wide open, its owner will tweak the needle to get just a *little* more speed; and regardless of how slowly his engine ticks over at idle, he can't refrain from adjusting this and that to get it turning even more slowly.

I heard someone cursing his O.S. Max at the field one day: "It ran fine last month when it was new, but it's shot now," he complained.

PHOTOS BY JOE WAGNER



Super Tigres have been around for 40 years. Late models like this .40 can stand a fantastic amount of abuse and keep running.

I took it home, and the only thing wrong was that the needle and air bleed were badly out of adjustment. On my test stand, I reset the carburetor controls, and the O.S. ran beautifully. Wide open, it turned around 14,000rpm, and it idled around 2,100, with very good transition between. In my book, that's *excellent*. I returned the engine and told its owner how I had fixed his "shot" motor.

I saw the same owner at the field about a month later, and I asked him how he liked his engine now. "It went bad on me again!" he grumbled. "I gave the #$*&@ away!" A cross-examination revealed that he hadn't been content to leave the carb controls where I had set them, but, trying for a little more speed and a slightly slower idle, he'd messed up the O.S. once again.

Leaving well enough alone is sometimes difficult to do, but if you want reliable, long-term performance from your model engine, it's best not to ask too much of it!

**Here are addresses that are pertinent to this article:*
***Eric Clutton,** 913 Cedar Lane, Tullahoma, TN 37388.*
***Tower Hobbies,** P.O. Box 778, Champaign, IL 61824.* ■

"Discovering Dr. Diesel"

Dr. Diesel for Beginners

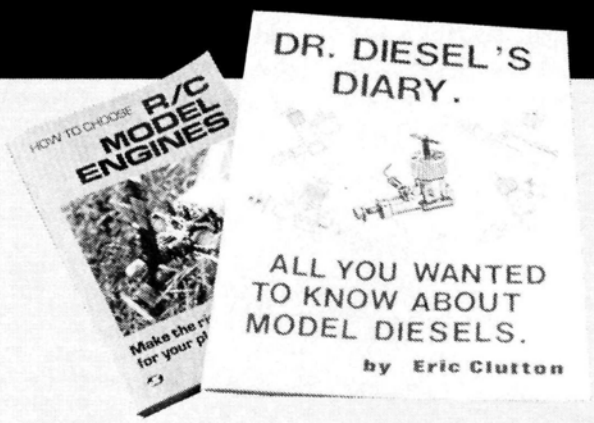
During the six years I've been writing this column, quite a few readers have asked if I could recommend a book about 2-stroke model engines. Though some such books have been available, I haven't endorsed any of them. It isn't that I find anything really wrong with them; it's just that I don't think they're worth their cost.

Take Motorbooks International's "How to Choose R/C Model Engines." It does contain a lot of miscellaneous useful data on model motors, but there's as much—or more—information in Tower Hobbies'* mail-order catalogue, which sells for $3. (That's less than a quarter of the price of the Motorbooks publication, and the Tower catalogue is a great deal more up-to-date.)

Now, however, there's a model engine book I recommend highly: it's Eric Clutton's* "Dr. Diesel's Diary," and it costs $11, postpaid. Though limited to model "diesel" motors, it's easily the most comprehensive and easy-to-understand since Don Foote's 1952 masterpiece, "Model Airplane Engines." The subtitle of "Dr. Diesel's Diary" is "All You Wanted To Know About Model Diesels," and it fulfills this claim.

The book covers basic operating principles, starting and running, fuels, tanks, propellers, hints and tips—and more! I've read the book three times to search for flaws in my usual nitpicking way, and I found only two things to criticize: on page 11, Eric implies that the only difference between aircraft-grade kerosene and heating-grade is its price. Not so: Jet "A" kerosene has been specially processed and stored to have minimum moisture content.

My only other adverse comment is that this basic safety tip for model diesels isn't stated, and it's very important: *never* idly flip a diesel's prop! If there's a trace of fuel in its crankcase, the motor can start!



Model engine books come in two varieties: fairly good and very good! Here's an example of each type.

KYOSHO STRATUS

(Continued from page 84)

the Stratus in the turns, it showed no tendency to tip-stall.

On the next flight, I used an 8.4V 900mAh pack. As soon as I advanced the throttle, I could tell that the rpm were up. With the power on, the Stratus rose more quickly, and it had greater air speed. This time, the model reached the same thermal altitude in about 40 seconds! I decided to find some thermals—no problem. The Stratus made the best of the moderate lift available. Because the plane handles a tight thermal turn so well, I was able to work very small thermals that I might have passed up with another model.

I timed the motor run on the 900 pack at 3 minutes, and at 40 seconds per "power-on" cycle, this means at least four climbs per charge. With the 6-cell 1200 pack, the motor run was almost 5 minutes. At 1 minute to altitude, this pack was good for four or more climb-outs. I also tried a 6-cell 1700mAh SCE pack. I didn't time the motor run, but I climbed to thermalling

(Continued on page 90)

CRASH COURSE

ELECTRIC HOBBY MOTORS

THE QUEST FOR THE "IDEAL" MOTOR IS MADE EASIER

by BOB SCOTT

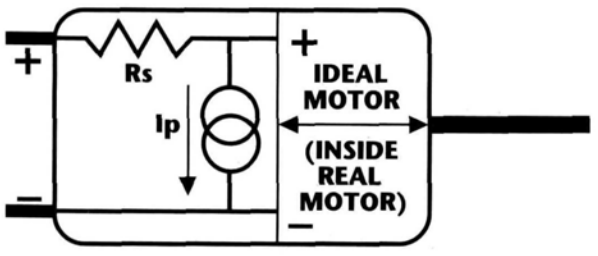
STEVE POND'S excellent motor-maintenance article in the March '90 issue of *MAN* prompted me to write this one from a completely different point of view. If a hobbyist reads and understands both, he deserves a diploma for being a motor expert! Grab a cup of coffee and put your brain in gear. Here we go.

This article presents electric-motor information that you usually don't see. After you read it, you'll be able to make *educated* decisions about your running gear—decisions that you previously entrusted to a hobby shop, experience, intuition, or rumors. Every DC electric motor has its own characteristics and specifications. If the manufacturer didn't supply them, you can discover some by experimenting.

Inside every electric motor is an "ideal" motor that has zero resistance, infinite current capability and, therefore, an unlimited horsepower rating. It will also turn a specific rpm for every volt that's sent across its terminals. Limitations occur because real motors contain non-ideal parts. (See figure 1.) The resistor in series (Rs) is the sum of the winding and brush resistances. The parasitic current flow (Ip) is a result of imperfect magnetic material and a gap between the magnets and the armature. All these things are measurable.

First, measure the rpm/V ratio. You'll need the motor (mounted on a stand), one or two charged 1.5V batteries, a multimeter and a hobby-type digital tachometer for props. First, calibrate the tach by pointing it at a fluorescent light. It should read 3,600rpm in two-blade mode and 2,400 rpm in three-blade mode.

FIGURE 1



Electronic equivalent diagram of a hobby motor

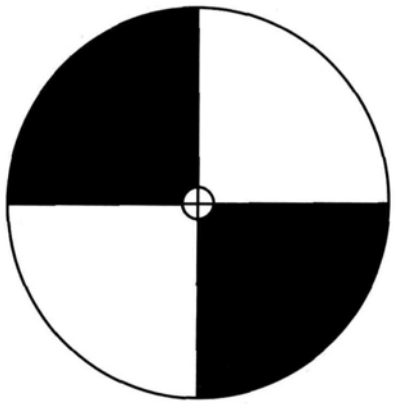
Copy or cut out figure 2, glue it to a small piece of cardboard, and mount it to the motor with a propeller adapter and some washers. *Don't use the cardboard at high rpm.* Connect the circuit shown in figure 3, and measure the rpm and the voltage across the motor's terminals. If the motor doesn't turn, add the other battery in series. Voltage across Rs will be negligible because the motor isn't loaded down by a prop, and this keeps current low. Divide the rpm by the voltage to determine the ideal motor's rpm/V ratio.

Next, measure the parasitic current (Ip). Put an ammeter capable of reading 10 amps in series with the motor. Again, don't load the motor with a prop. Without a load at the shaft, very little current flows through the ideal motor. Using two cells (as in figure 4), measure the motor's current draw at low rpm. This is the Ip, and it should be less than 1 amp.

Using more cells in series won't affect the current reading much because the parasite is a "constant current source," but the current will rise slightly owing to bearing and brush drag. (Motors with ball bearings have significantly less drag.) If you advance the motor's timing by rotating the backplate, Ip will increase. You can now calculate the maximum time that your battery pack will last, even if you don't load your motor much (proportional controllers excepted). Just divide the pack's amp-hour rating by Ip. Some packs are rated in milliamp-hours, and 1Ah = 1000mAh.

Finally, find Rs, or the series resistance. Rs is so low that you can't measure it with a multimeter. Install a propeller on the motor and use the same circuit as in the last experiment, but with only one cell. Stall the motor by holding the prop. *(Use common sense:* if you use more than one cell, you might injure your fingers and overload the meter.) Rotate the prop very slowly by hand while "bucking" its torque, and note the average current draw. The reading will fluctuate as you turn the prop.

FIGURE 2



Tach wheel (see text)

Since the voltage across the ideal motor is zero at very low rpm, all the battery voltage is across Rs. Rs = V/I, where V is your battery voltage and I is the measured current. Resistance Rs is the only reason your motor loses rpm, or bogs down, under load. Because it steals some of your battery's voltage, the ideal motor receives less.

REFRESHER COURSE

Let's review some motor theory so that we can put this data to use. Motor power output is dependent on rpm and torque. Horsepower = rpm x torque. With electrics, rpm is the same as voltage (remember the rpm/V ratio?), and motor amperage (I) is the same as torque. P = V x I. The two equations mean the same thing.

If your motor is seized or stalled manually, rpm and V (across the ideal motor) are zero, and power output is zero.

If no prop is installed, the motor revs, but torque and ideal motor current are zero—again, no power output. For maximum output power with a given battery-pack voltage, there's an optimum load for your motor. The secret is revealed if you know the value of Rs. There's a law in electronics that states, "Maximum power is transferred to the load when the load resistance equals the source resistance." In practice, it's not as complicated as this.

Maximum power is transferred to the prop when the resistance of the ideal motor equals the value of Rs. Voltage across the ideal motor will be half of the voltage of your battery pack. With a prop, the rpm of your motor will be half of that without one. To calculate the rpm without a prop, multiply the experimental rpm/V by your battery voltage. Try bigger props until the measured rpm is half of that. Unfortunately, this means that half of your battery power is being wasted in Rs.

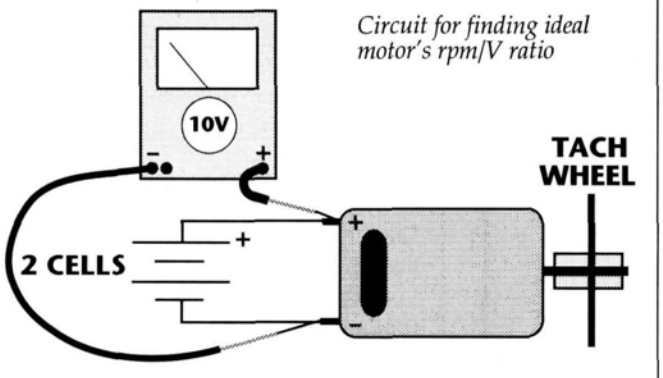
You might also exceed your motor's maximum-current rating, but short bursts of power for takeoff could be all right. After takeoff, rpm will rise and current will drop. Power will drop, too, but efficiency will rise.

As an example, let's use the specifications of the Astro* 15 cobalt motor.

- Maximum output power—180 watts
- Maximum input voltage—15 volts
- Maximum input current—26 amps

If we multiply the max V and I, we get 390 watts input. Half of that is 195—the ideal motor output power. Subtract several watts for internal friction and Ip, and you have a specified motor-output power of 180 at the motor shaft. If you're shopping for a motor, be aware of the difference between rated input and output power.

FIGURE 3



Circuit for finding ideal motor's rpm/V ratio

By now, you must be wondering if driving a motor at maximum power is a good idea. After all, if you waste half of your power heating Rs, you need twice as much weight in batteries as a system that operates at 100 percent efficiency, and weight means a lot in electric flight. Although 100 percent is impossible to achieve, you can do better than 50 percent. A bigger motor driven at less than full power will use less input power and require less battery weight. Total weight will be less at the identical output wattage.

Alternatively, if you use a smaller prop or an efficient speed controller, the motor will go more slowly and efficiency will rise. Adding a gearbox to the plane also helps. Remember hp = rpm x torque? By adding gears, you can increase rpm, reduce current (torque) requirements, lower Rs power losses and still keep hp the same.

If you use a speed controller, you should be aware of some special energy-management problems. Hardly anyone uses a servo-controlled switched resistor pack (or servo-controlled rheostat) anymore, but it's a good starting point for this illustration. The resistance of this controller always wastes energy because, at every speed except max power, there's voltage across and current flowing through it (P = I x V). Ip continues to flow at any speed setting, and that will drain your batteries.

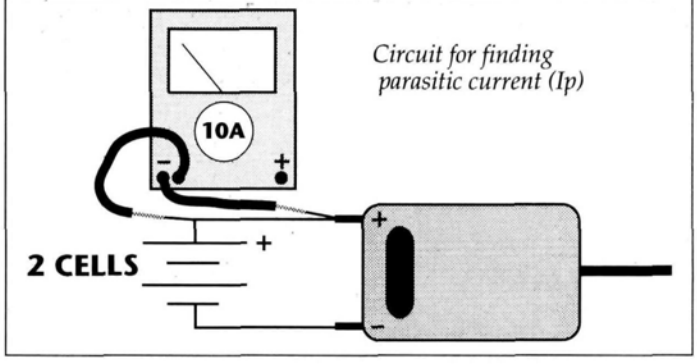
The proportional controller commonly used now solves both problems. It works by pulsing power to your motor 50 times per second (50Hz). It turns full-on for a few milliseconds and then shuts off completely; this cycle is repeated every 20 milliseconds. By varying the on/off timing ratio, motor speed varies.

Ideally, the power Mosfets used to switch the power don't absorb power because V across them is zero when they're on, and I is zero when they're off. Parasitic current can't flow through the motor when they're off, either, so Ip decreases as you reduce throttle. In reality, the Mosfets do have a little resistance when on, and they absorb some power. This is the "voltage-loss" specification provided by the manufacturer, and it's expressed in volts per amp, or ohmage (resistance expressed in ohms). A heat sink is sometimes necessary to prevent excessive Mosfet heating at very high current levels.

This power loss is small, however, when compared with other losses created by the controller. The controller also causes great current surges and power losses in the motor by pulsing a high voltage across little Rs. That's battery voltage minus the voltage across the ideal motor. Remember rpm/V? Voltage across the ideal motor is very low at low rpm. Even if the controller stays cool, it doesn't mean that the whole circuit is operating efficiently. I predict a breakthrough in efficiency with new technology very soon.

There's an optimum motor, load and battery combination for every model. Remember that a system that's optimized for maximum power is very different from one that's optimized for maximum running time. So many variables affect the calculation of an optimum power train for max running time that, for now, experimentation is the best approach. A little knowledge makes this job easier. Perhaps a computer program is in order. Making one would be a real challenge. Any takers?

FIGURE 4



Circuit for finding parasitic current (Ip)

**Here's the address of the company mentioned in this article:*
Astro Flight, Inc., *13311 Beach Ave., Marina del Rey, CA 90292.* ■

KYOSHO STRATUS

(Continued from page 87)

altitude seven times! With only moderate lift, it's possible to stay up for 30 to 40 minutes without much effort.

I allowed a friend with limited experience on a power trainer to fly the Stratus. At first, he found it overly responsive and had trouble with over-control, but after he calmed down and got used to the way the model flew, he gained altitude in the moderate lift. On 6-cells, there's almost no change in trim between power-on and glide. During power-on flight with the 7-cell pack, I had to fly with a small amount of down. These differences aren't great enough to give beginners much trouble, though.

STRATUS STATUS

Like most ARFs, the Stratus 2000 seems expensive until you consider everything you receive. The construction is straightforward and strong; the motor performs well on six or seven cells, and the prop is of the efficient scimitar, folding type. Everything you'd want in a model that you'd build for yourself is included in one

(Continued on page 111)

HELICOPTER SECTION

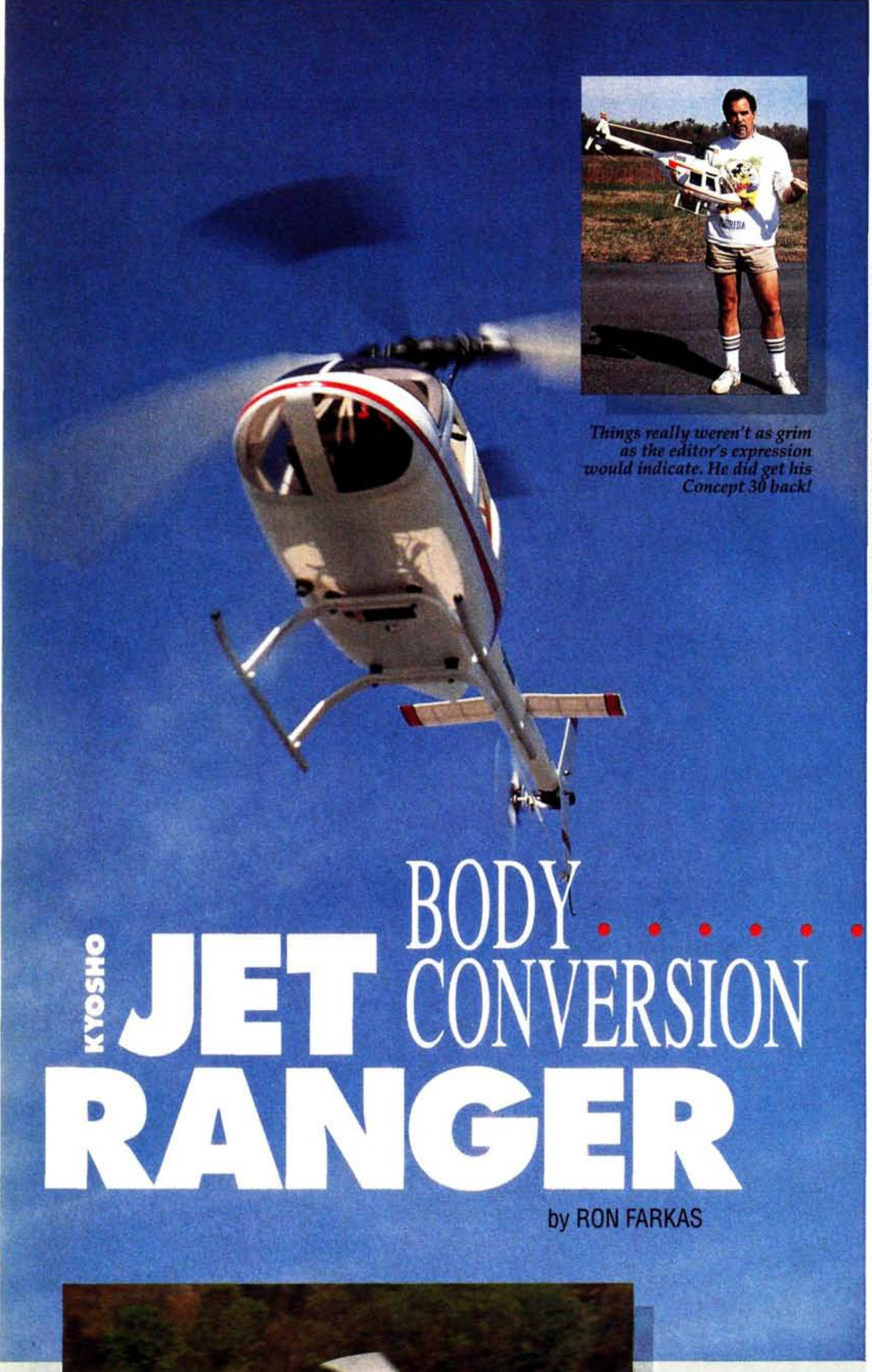
Looking right at you (above) is a Concept 30 in another "outfit." This time, it's the Kyosho Jet Ranger conversion. As you'd expect, it fits the Concept like a glove, and Ron Farkas shows you how he accomplished the change on the editor's heli.

A. E. Stanley borrows some successful painting techniques from R/C car racers and applies them to clear heli bodies. The method involves a bit of "thinking backwards" (not backwards thinking!), because the paint is applied from the inside, but it's effective, durable, and it will work well for you.

Coming in future issues: Larry Jolly's Pad and Bench Review of the new Robbe Whopper Autogyro; Datu Ramel's series called "Hints and Helo-ese"; and coverage of the First Annual Kyosho R/C Helicopter Challenge.

I encourage all you heli fans to participate in our "Pilot Projects" section. All it takes is a picture or two of your machine, either static or in flight, and a brief description. You could be eligible for a $500 prize! Send in your photos!

RAU



Things really weren't as grim as the editor's expression would indicate. He did get his Concept 30 back!

B&W: RON FARKAS; EKTACHROMES: RICH URAVITCH

KYOSHO JET RANGER BODY CONVERSION

by RON FARKAS

THIS ARTICLE COULD have been titled, "What to do with your Concept 30 after you've learned how to fly," but that would have done an injustice to this little machine. I was probably the only guy on my block who didn't own a Concept 30, so Editor Rich Uravitch donated his for this project.

Many helicopter fliers start out with the Kyosho* Concept 30 because of its low cost and convenient size. While learning, they may discover that it's a capable sport flier with the potential for aerobatics, too. Beginners often retire their trainers when they graduate to larger, or more advanced helicopters, but the installation of a Kyosho Jet Ranger fuselage can breathe new life into your Concept 30 and add a new dimension to your enjoyment of heli flying!

The result of the transformation looks like a recognizable scale helicopter, but it's just for fun, not scale competition. Because the conversion doesn't require a big investment of time or money, you can fly it anytime, instead of saving it for a few events a season. Kyosho must have had this in mind when it designed the Jet Ranger and its companions—the Hughes 500 and 300. (See the September '89 issue for Datu Ramel's review of the Hughes 500 body.)

Kyosho kept the price low by making the body shell of blow-molded plas-

Dress your Concept .30 in a new, scale-like suit of clothes

tic, rather than fiberglass. This is the same plastic as the stock Concept canopy; it appears to be polyethylene and resembles supermarket bleach bottles. Because the shell is merely cosmetic, it needs only enough strength to hold its shape. This plastic has added benefits: it's light and doesn't have to be painted. The material is opaque white, with a moderate gloss and a rather slippery feel.

The fuselage kit includes front and rear main-body shells with separate windshield pieces, a tail cone, vertical and horizontal fins, replacement landing gear and installation hardware. There's also an instruction booklet and a selection of pressure-sensitive decals.

Very little work is required to mount the body on the Concept 30 mechanics: the frame and tail boom are used as is, and the body shell is attached in only a few places, so it can be removed for major servicing, if necessary. Four pages of instructions cover 10 major assembly steps. As is typical of Kyosho instructions, each step is described by several illustrations and a few brief notes. Of course, some of the work is more involved than the instructions suggest, but there's nothing really complicated to do.

"...breathe new life into your Concept 30 and add a new dimension to your enjoyment of heli flying!"

Ron prepares the newly clad Concept for its test hop. Fueling and engine tuning are easy to do through the open side windows.

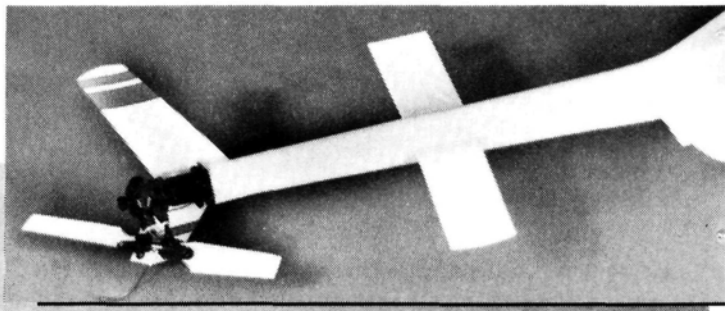
THE TRANSFORMATION

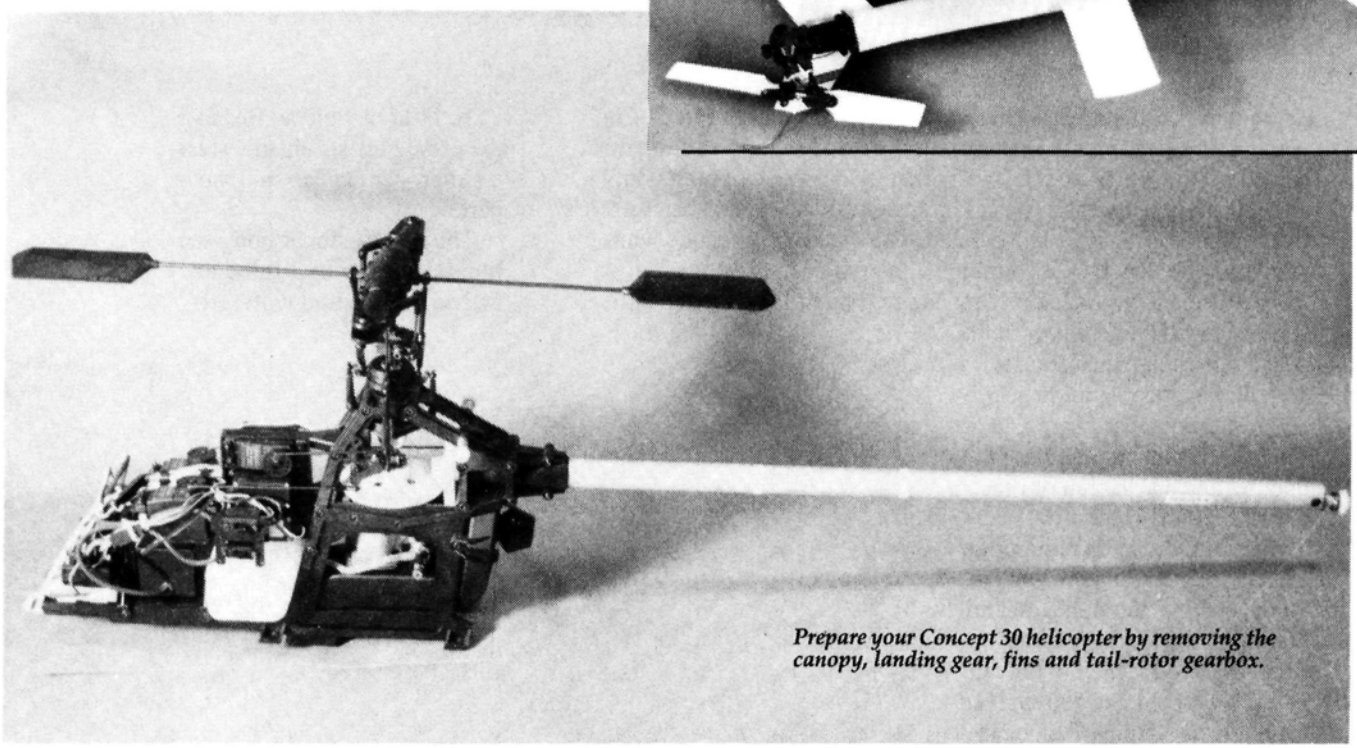
To prepare the Concept 30 mechanics, remove the landing gear, fins and tail-rotor gearbox. If you're building a new kit, stop short of installing these parts. The original starting cone must be replaced with one that accepts a special extension. Prepare the fuselage by removing all the window sections and installing the tinted front windows. The safest way to cut out the windows is to make several light passes with a no. 11 hobby blade. Because the plastic resists all adhesives, an improper cut can ruin the part.

The front and rear body sections should be trial-fitted together and secured with self-tapping screws. The plastic holds its shape well and is cleverly molded so that the seams key together to stay aligned. The instructions suggest that you apply the decals before you mount the fuselage: this turned out to be a very good idea; the fuselage stayed clean and was easy to handle when I stretched some of the decals around compound curves.

After removing the original landing gear, install four extensions on the frame for body

BODY CONVERSION
JET RANGER

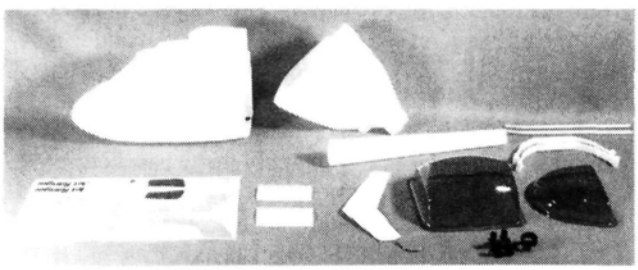




Prepare your Concept 30 helicopter by removing the canopy, landing gear, fins and tail-rotor gearbox.

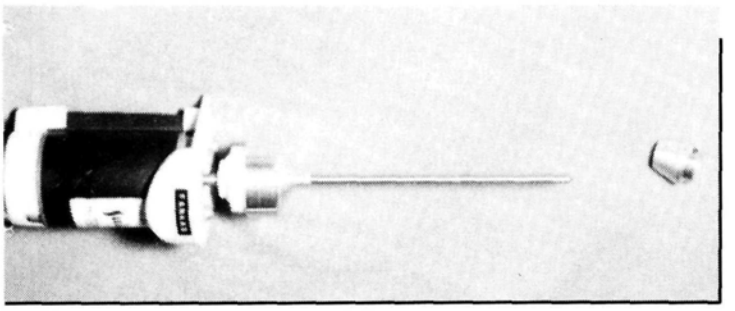
alignment and increased ground clearance. Slip the aft section over the tail boom and fasten it to the frame using the original canopy-mounting locations. Fit the forward section over the frame and mate it to the aft section. Next, install the replacement landing gear, which is simply a stock set in white to match the body. Depending on the style of muffler you use, you might have to cut a hole for the exhaust outlet in one of the sections. I ran a short length of rubber tubing out through the bottom of the forward section. There seems to be plenty of clearance for common mufflers, but not for the tuned-pipe variety.

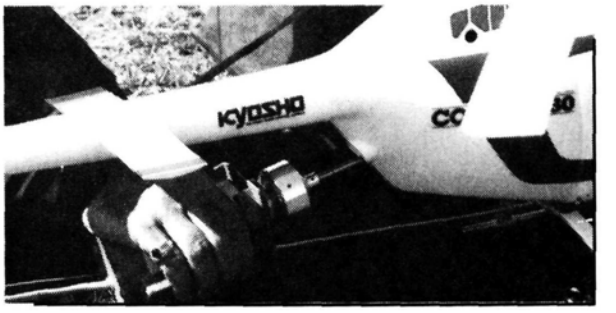
Slip a collar-shaped stabilizer bracket over the Concept's tail boom, and follow this with the tail-cone part of the fuselage. Each horizontal stabilizer is attached by a screw that extends from its root, through the tail cone, and is threaded into the bracket. The holes on each side of the tail cone must be raised about 1/8 inch so that they line up with those in the bracket. Now, you can reassemble the tail-rotor gearbox on the end of the tail boom and attach the new, scale, vertical fin in the same way as you attached the stock fin. (The instructions showed the main-rotor head removed for this project, but I left it in place, and it didn't interfere with the fuselage installation.)



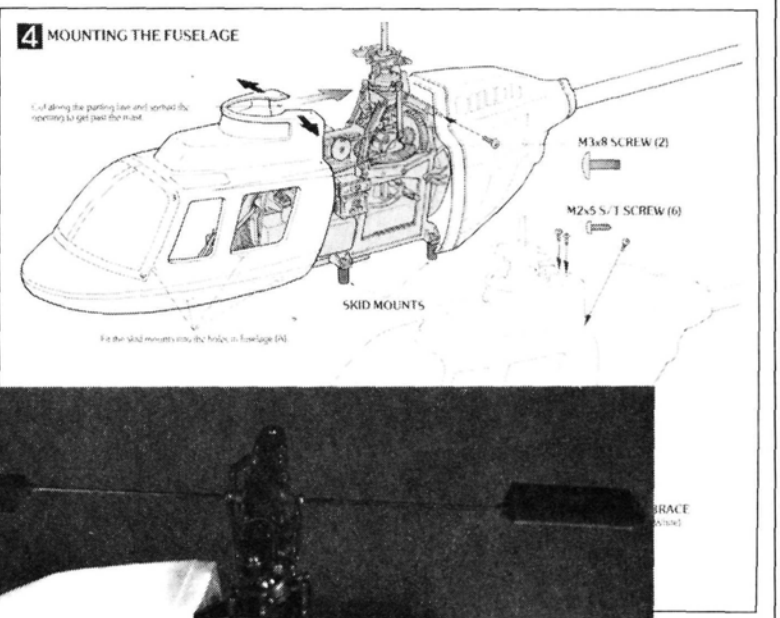
The Jet Ranger fuselage kit consists of blow-molded-plastic body sections, replacement landing gear, fins and hardware. There are no wooden parts.

Finally, mount the starter-extension probe to your electric starter. The Jet Ranger fuselage already had an access hole in the aft section through which the probe could be inserted into the new starting cone. There was also a hole for the glow-plug clip, but it takes approximately a 4-inch extension to reach the plug. Access to the switch, the



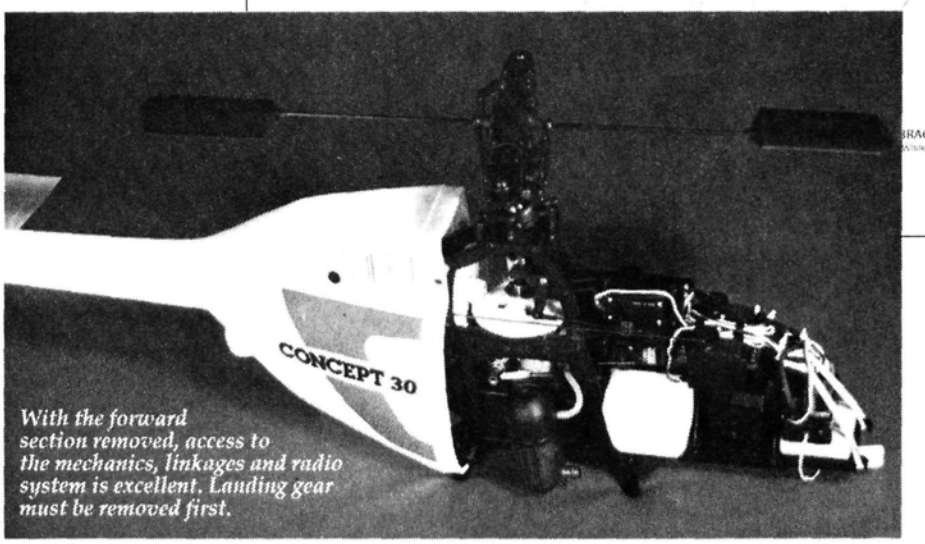


Above Left: Horizontal stabilizers are screwed into a bracket on the tail boom inside the tail cone. Vertical fin is attached to the gearbox using the original mounting locations. Above Middle: Kyosho markets an accessory starting cone and probe. The probe is inserted into the cone (which has a one-way clutch) and attached to the regular starter adapter. Above Right: The starter probe is inserted through the access hole into the clutch on the optional starting cone.



fuel line and the needle valve is easy through the open side windows.

As with any full-fuselage helicopter, major maintenance is more complicated. Although the forward section is removable, the landing gear must be dropped first. Fortunately, the process takes only 5 minutes (not counting time spent looking for lost screws in the grass!). You can't remove the aft section without first disassembling the tail-rotor unit and removing the fins. To service the radio and linkage, you generally have to remove the forward section, and to service the engine, you must remove the aft section. The Concept's usual method of tail-rotor-trim adjustment at the midpoint connector link is out of the question, so use an adjustable ball clevis, rather than a Z-bend, at the servo arm.



With the forward section removed, access to the mechanics, linkages and radio system is excellent. Landing gear must be removed first.

THE RESULTS

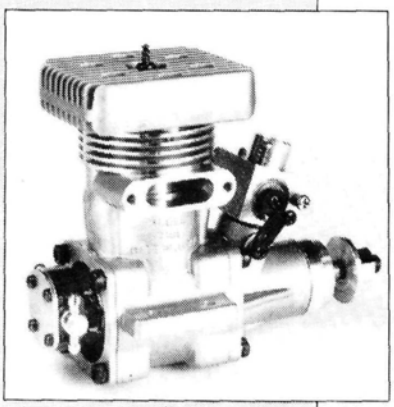
The addition of a Jet Ranger body made little or no difference to the Concept 30's fine flying characteristics. Surprisingly, there was no obvious shift in the center of gravity. Some people think that a body makes a helicopter more streamlined (and therefore faster), or that it makes it track better in forward flight. This is probably true, but it isn't particularly critical on a sport machine. There were no ill effects from the stall-weight penalty, either, and the engine performs well with no sign of overheating. The plastic looks as though it will withstand a good deal of punishment, and the decals are holding up well, especially because fuel residue doesn't build up on the body's exterior.

This conversion was very successful, and the Concept 30 is even more fun to fly with Kyosho's optional Jet Ranger body! Of course, I had to give the heli back to Rich Uravitch, but I was so impressed that I've since bought a Concept 30 for myself!

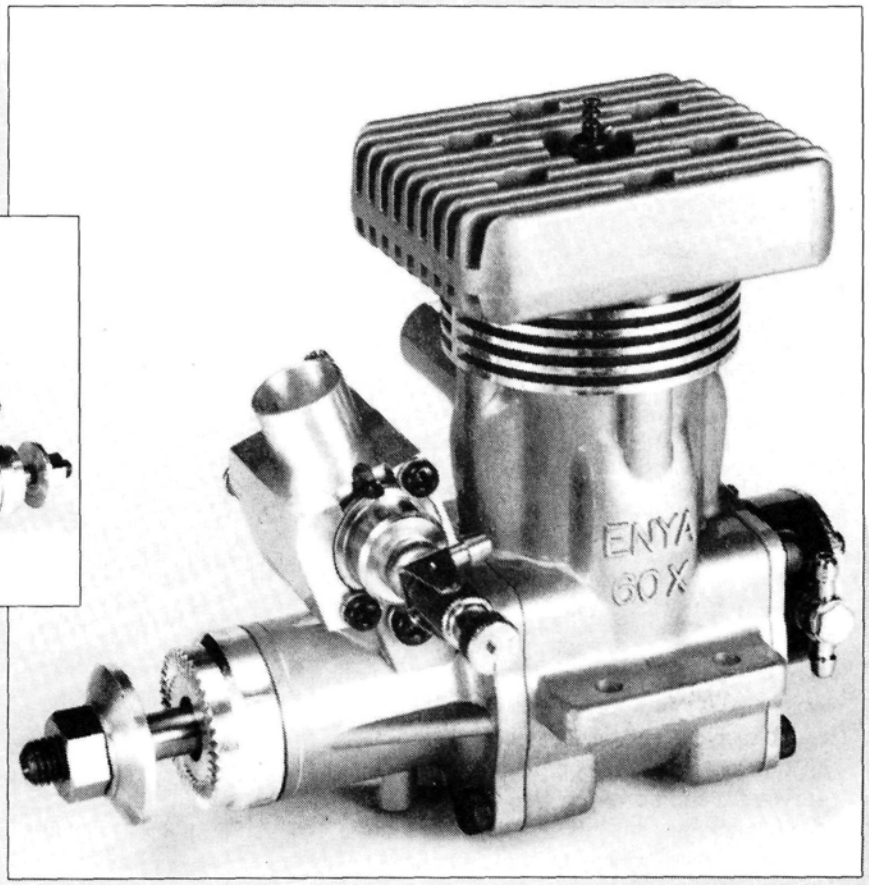
**Here's the address of the company featured in this article:*
***Kyosho/Great Planes Model Distributors,** P.O. Box 4021, Champaign, IL 61820.* ■

ENGINE EVALUATION

ENYA .60 XF HELI



Above: Gear-type fuel pump at rear and large-bore carb gave high power on test. Aluminum chromed liner is still Enya's preferred option for maximum power output.



PHOTOS BY MIKE BILLINTON

A great fixed-wing powerplant modified for heli applications

by MIKE BILLINTON

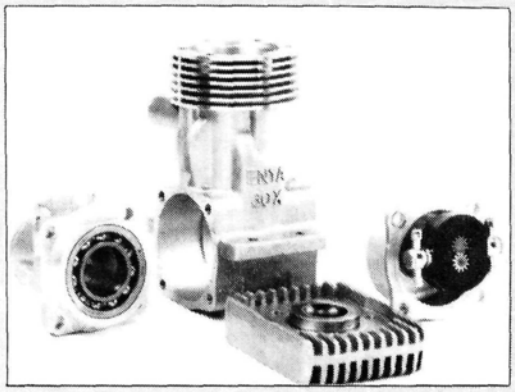
LIKE SOME OF Enya's .60-cubic-inch, 2-stroke motors, this test engine apparently requires a lengthy identification number: Enya (GP 60XF-4H) Al-Chrome. This new, top-of-the-line, 10cc helicopter engine continues the Japanese tradition of efficiency and trouble-free operation at powerful performance levels.

This engine has a highly effective gear-type fuel pump that has two benefits:

- It allows enlargement of the carburetor bore/front induction passage.
- It provides a very positive fuel feed in high-G situations.

Enya's preferred "plain-piston" technology of aluminum/chromed cylinder and high-silicon piston means that, like its partner R/C aerobatic fixed-wing aircraft engine, this one exceeds Enya's claims at 1.9hp. Enya gives no clear indication of the length of tuned pipe required, fuel, or rpm levels. My results indicate that Enya's figures are for open-exhaust running, though nitro content could be anywhere from 5 to 20 percent.

My test results show Enya's performance claims continue to be modest; but, even more important, the engine always runs solidly and reliably.

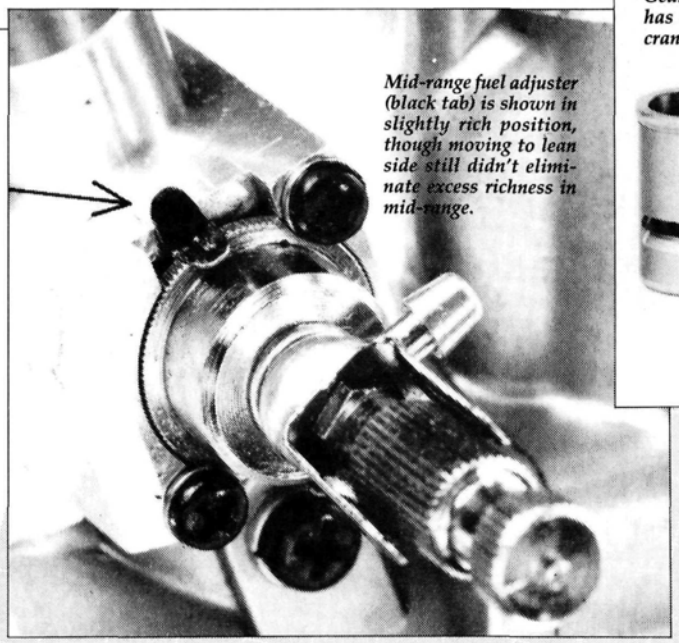


Small gear fuel pump is shown on right. (Cover plate has been removed.)

MECHANICAL DETAILS

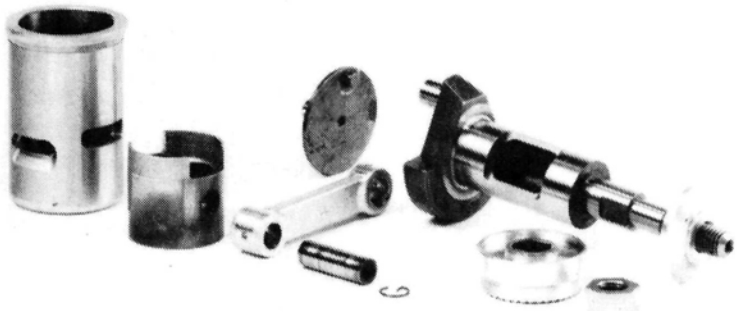
With this engine, Enya continues its firm commitment to Schnuerle porting in a 2-stroke, and at present, manufacturers have little reason to forsake this highly efficient induction system. It would be interesting to see some of the more fascinating, full-size, 2-stroke design features in model engines. If, as is rumored, a Roots-style supercharger will soon be seen on a model 4-stroker, then many avenues could open.

The piston is machined from a high-silicon alloy casting and uses a hollow, circlipped, 1/4-inch-diameter wristpin, in what's basically a metric engine.



Mid-range fuel adjuster (black tab) is shown in slightly rich position, though moving to lean side still didn't eliminate excess richness in mid-range.

Gear-pump drive is by means of a crankpin, and the circular disc has a protruding peg to receive the drive. Rigid, massive Enya crank handles high power levels without problems.



At 145 degrees, the exhaust timing is quite conservative, although the blowdown timing (the period between exhaust and transfer closure that's essential for good tuned-pipe response) is at an acceptable 15 degrees.

The cylinder-head is the standard domed type with wide squish band, and it's machined in one piece with typical helicopter heat-sink fins. Squish clearance is a large .040 inch, which suggests that stress-free, highly reliable performance was a prerequisite. It also suggests that there's much performance still locked into this already high-performance motor, i.e., tighter squish/higher exhaust timing/longer blowdown period. There's no cylinder-head gasket, so you can't tighten squish clearance if you want to increase performance, so Enya's determination to ensure reliable "soft" running seems to be paramount.

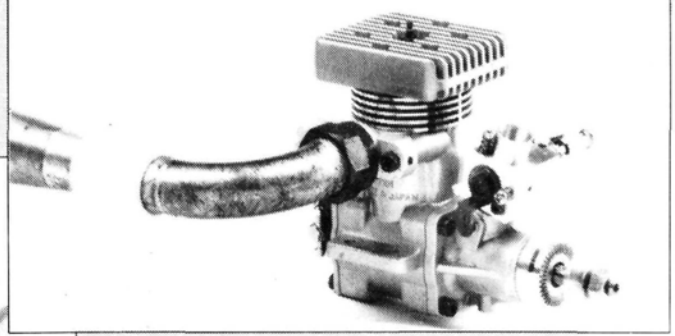
The engine has a really robust steel crankshaft with a 17mm main journal, and it has the sensible, propeller-style driving method, i.e., two flats on the crank shaft behind the prop-retaining nut.

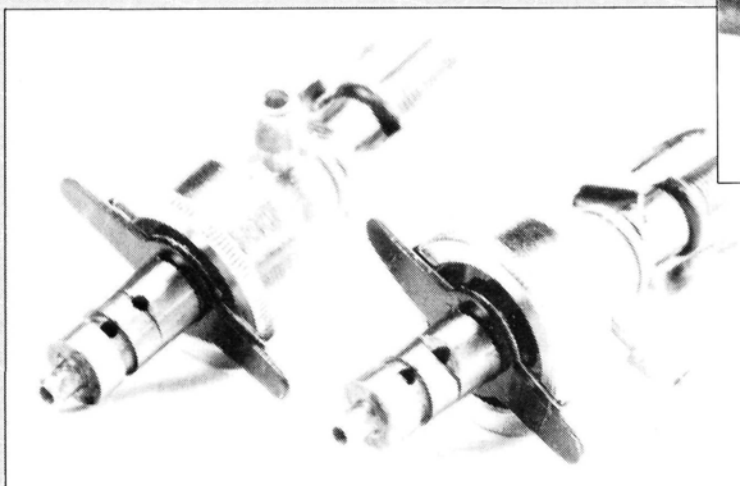
The rear cover incorporates the peg drive from the crankpin to the fuel pump. As the initials "GP" indicate, this takes the form of a pair of straight-cut gears that draw from the fuel source and then force fuel into the 10mm-bore carburetor. Anticipating that, in some aerobatic maneuvers, air will be sucked up from fuel tank, Enya has fitted the pump with a "bypass" circuit that effectively breaks down air bubbles to minimize the interruption of fuel flow. The dyno is, of course, not fully aerobatic, but I've occasionally seen air in this circuit without seeing any change in engine operation or need to change fuel settings.

The device operates at a range of pressures—apparently linear with rpm. I measured pressure readings from a low .5psi at 3,500rpm to a high 6.25psi at 20,165rpm.

With this fuel pump, the engine uses Enya's new large-bore carburetor (the GM10GPH!). This uses standard, main-needle control and an air-bleed screw for idling control. For mid-range mixture strength, however, an adjustable concentric-tube device with a tapered slot fits around the main spray-bar to give an adjustable opening that varies as the air-throttle barrel closes.

Enya's large threaded nut is used for exhaust-manifold fixing and is fuelproof, solid and adjustable.

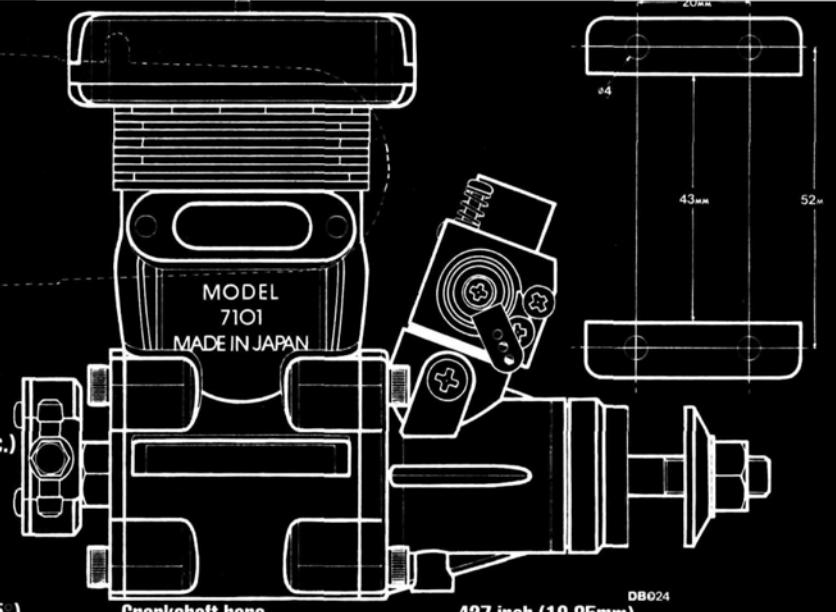




Spraybar from this 60 heli engine is on right. It shows wider mid-range slot than the version fitted to the 60 fixed-wing (pattern) engine shown on left. The spraybar can be rotated by swivelling the protruding black tags, and it thus varies mixture strength in mid-range.

As the photograph shows, the arrangements for mid-range adjustment are different from the usual secondary-needle style and are well-engineered. On this test engine, however, the available range of post-throttle mixture adjustment wasn't enough to prevent some over-richness of settings as the throttle was gradually closed. The tapered slot in the spray-bar (which has been specifically widened for helicopter-engine use) seems to contribute to this for two reasons: first, Enya's experience of a heli's requirement for stable fuel/air mixture strengths at partial throttle openings; second, dynamometer tests don't usually simulate the actual dynamic loads

ENYA .60 XF HELI



45% OF FULL SIZE

SPECIFICATIONS

Capacity	.60675 cubic inch (9.943cc.)
Bore	.9445 inch (24mm)
Stroke	.8660 inch (21.9964mm)
Stroke/bore ratio	.9169:1
Timing periods	Exhaust- 145°
	Transfer- 115° (up 15°)
	Boost - 110° (angled up 55°)
	Front Induction :
	Opens - 32° ABDC
	Closes - 50° ATDC
	Total Period - 198°
	Blowdown - 15°
Combustion volume	.98cc
Compression ratios	Geometric - 11.14:1
	Effective - 8.04:1
Exhaust-port height	.265 inch (6.75mm)
Cylinder-head squish	.040 inch (1.02mm)
Cylinder-head squish angle	0°
Squish-band width	.172 inch (4.38mm)
Carburetor bore	.395 inch (10.05mm)
Crankshaft diameter	.669 inch (17mm nominal)
Crankshaft bore	.427 inch (10.85mm)
Crankpin diameter	.275 inch (7mm)
Crankshaft nose thread	7mm x 1mm
Wristpin diameter	.250 inch (6.36mm)
Connecting-rod centers	41mm
Engine height	3.96 inches (100.5mm)
Width	2.44 inches (62mm)
Length	4.24 inches (107.8mm)
Width between bearers	1.69 inches (43mm nominal)
Mounting-hole dimensions	52x20x4.25mm
Exhaust-manifold bolt spacing	1.34 inch (34mm)
Frontal area	7.48 square inches
Weight (bare)	20.8 ounces (590gm)
Crankshaft weight	3.4 ounces (96gm)
Piston weight	3 ounce (10gm)

imposed by the helicopter drive train and large blades—things that could require slightly different fuel settings. The over-richness was equivalent to three notches of main-needle control at half-throttle and seven notches (one-fifth of a turn) at quarter-throttle.

As a result of this finding, the performance parameters (as throttle closes with rpm being held constant by use of load reduction) were somewhat difficult to establish—difficult enough to prevent their easy inclusion in the usual power graph. Using the standard muffler, the figures, were:

Throttle	oz./in. torque	BHP
Open throttle	11	1.61
1/2 throttle	68	99
1/3 throttle	28	41
1/4 throttle	12	17

(BHP: all at 14,500rpm)

A test of the Enya 60X GP fixed-wing engine (with a narrowed spray-bar slot) is due shortly, so I'll be able to assess the mid-range differences between the two types of spraybar.

PERFORMANCE

This engine needed relatively little running-in, and rpm on several fixed-wing propellers showed that steady operation was quickly available.

Test 1. Open exhaust. 5% nitro/15% castor oil/3% ML 70 synthetic oil/77% methanol. OPS 300 glow plug.

To keep the test comparable with previous tests of heli engines, I followed Enya's recommendation to use 5 percent nitromethane. Enya recommended 20 percent castor or synthetic oil.

Maximum torque of 136 ounce/inch appeared at 12,628rpm, and the horsepower maximum of 2.04 was reached further on—over a flat peak between 17,000 and 19,000rpm.

Test 2. Enya standard muffler. Fuel and plug as in Test 1.

Use of this standard aircraft muffler led to the usual torque and horsepower reduction—particularly when rpm rose above 10,000. In this configuration, the hp maximum was held back to 1.64 at 14,452rpm. As expected, fuel consumption was reduced when this back-pressure muffler was fitted.

Test 3. Enya tuned pipe (TM 604) at 320mm from plug to first maximum diameter or, using Enya's measuring method, 500mm from the plug to the extreme end of the pipe (in a straight line). Fuel and plug as in Test 1.

Operated at this "out-of-the-box" uncut length, this quiet tuned pipe proved to be an effective silencing device. It also offers a fairly wide band of nominally full-resonance performance, i.e., where high torque is maintained. This covered approximately from 9,500 to 14,000rpm. This full-length, flexible setup seems ideally suited to rotor-head ratios of approximately 7 1/2:1 and head rpm of 1,700.

Enya advises that the use of its gear-type fuel pump makes any other fuel-pressure system—like pipe or silencer pressure to the fuel tank—unnecessary. On the dynamometer, any large rpm increase as the tuned pipe came to full resonance didn't need any fuel-control adjustment to compensate. This verifies that the fuel pump was well-matched to the pipe/engine requirement.

Test 4. Enya pipe at 260mm (plug/maximum diameter) or

Performance:

Max. BHP	2.31 @ 16,208rpm	(Pipe @ 260mm)
	.04 @ 17,800rpm	(Open exhaust)
Max. Torque	160 oz. in. @ 12,246rpm	(Pipe @ 320mm)
	136 oz. in. @ 12,638rpm	(Open exhaust)

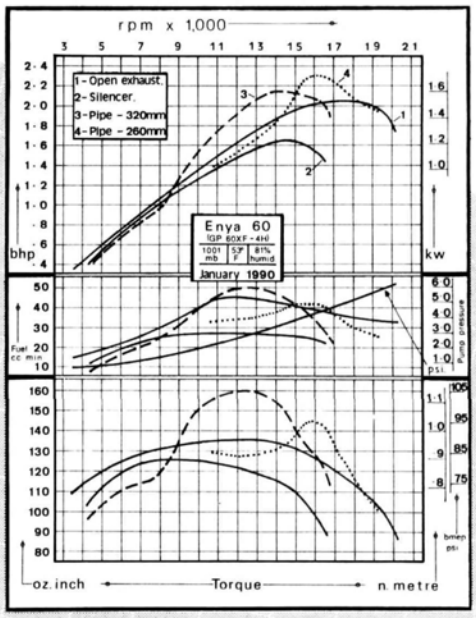
RPM on Standard propellers:

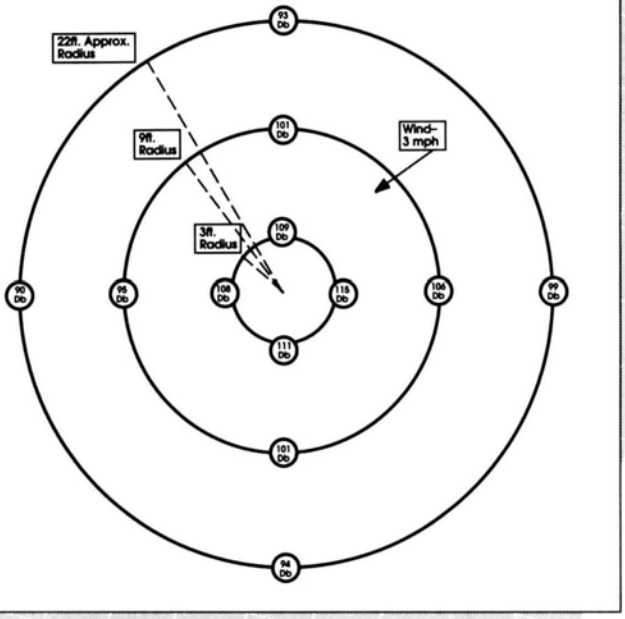
	Open Ex.	Enya Muffler	Pipe: 320mm	Pipe: 260mm
14 x 7 Graupner	8,653	8,303	8,860	—
13 x 6 MK (glass)	11,053	10,693	11,702	—
12 x 7 Mastro	11,440	11,005	12,383	11,078
12 x 6 Graupner	12,913	12,189	13,640	12,420
11x 6 Graupner	14,477	13,799	14,734	15,168
10 x 6 MK	15,573	14,814	15,714	16,008
10 x 4 Zinger	18,126	16,543	16,887	18,255

Performance Equivalents:

BHP/cu. in.	3.80
BHP/cc.	.232
Ounce inch/cu. in.	263.7
Ounce inch/cc.	16.09
Gm. meter/cc.	11.49
BHP/pound	1.77
BHP/kilo	3.91
BHP/sq. in. frontal area	.308

Manufacturer: Enya Metal Products Co. Ltd., Toyko, Japan.
U.S. Distributor: Altech Marketing, P.O. Box 391, Edison, NJ 08818.





450mm, using the Enya measuring system. Fuel and plug as in Test 1.

To investigate the possibility of higher rpm/higher horsepower, I removed a 2.36-inch (60mm) length of the well-engineered, curved exhaust manifold provided by Enya and re-started the test at 10,000rpm.

Maximum resonance and torque now appeared to be some 3,300rpm higher, so although the torque value was reduced, the resulting horsepower was the highest achieved during this test: 2.31 at 16,208rpm. The flexible Enya pipe allowed rpm to rise still further, to a final 19,200rpm, where 1.99hp was still being produced. At that point, performance returned to open-exhaust levels.

IDLING PERFORMANCE

Using an admittedly large-load propeller—a 13x6 MK glass—idling performance with the standard muffler was remarkably good and precise. These are always welcome features of the simple, Enya, air-bleed system. I noted rpm down to 1,578, and with a long tuned pipe, a similar 1,620rpm was easy to achieve. In both cases, the thick-element OPS 300 glow plug gave good, clean idling and "stumble-free" acceleration as the throttle was opened.

SUMMARY

At the end of the test, the engine was in great condition, and healthy compression was still evident. Enya continues to offer fine engines with unpretentious designs and, in my experience, test results from these no-nonsense engines always indicate satisfying, unfailingly solid performance. ■

SOUND LEVELS—dB

Engine:	Enya .60 XF (Heli)
Equipment:	Enya muffler
Fuel:	5 percent nitro/15 percent castor/3 percent ML70/77 percent methanol
Engine position:	3 feet above hard earth
Temperature:	50°F.
Humidity:	75 percent
Propeller:	11x6 Graupner
Mean rpm:	13,650
Sound meter:	Radio Shack's Model 33-2050 set 38 inches above the ground and pointing horizontally toward nearest sound, i.e., propeller, or open exhaust out lets. Three distances were used, and on four axes: 3 feet, 9 feet and approximately 22 feet.
Meter settings:	"A" Scale and "Slow" response.

ROTARY-WING ROUNDUP

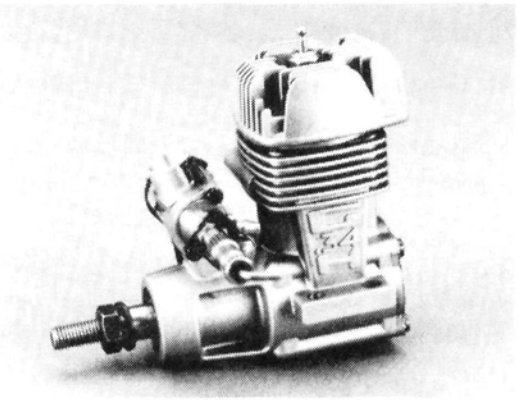
KALT
Enforcer

This 30-size RTF features a fully aerobatic rotor head; patented mixing system; top cone starter; forward-canted engine; highly efficient, sealed transmission with a planetary drive-gear assembly; high-quality, yet inexpensive, balanced rotor blades; modular design for easy maintenance; and readily available parts.

For more information, contact Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

SUPER TIGRE
G-34H

Designed to fit many popular 30-size helicopters, the Super Tigre G-34H features dual ball bearings, an ABC ring-cylinder assembly and standard O.S. mounting holes. A swing muffler is included. Weight: 9.5 ounces; bhp: 1.1 at 16,000rpm.
Part no. SUPGO734
Price: $179.95
For more information, contact Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.



HOBBY LOBBY
Collective-Pitch Conversion

This conversion for the Hobby Lobby Sport 500 is constructed in the same simple, solid, durable way as the helicopter. It uses metal parts that endure mishaps, and, unlike plastic heads, this head can be lubricated and maintained. The kit is easy to install and provides more prompt control response for better flying.

For more information, contact Hobby Lobby International, 5614 Franklin Pike Cr., P.O. Box 285, Brentwood, TN 37027.

ROBART MANUFACTURING
Helicopter Blade-Pitch Meter

This model has a redesigned blade clamp for accurate meter positioning without slop. The precision pointer accurately sets heli pitch angles to within 1/8 degree.

Part no. 405
Price: $39.95
For more information, contact Robart Manufacturing, 310 N. 5th St., St. Charles, IL 60174.

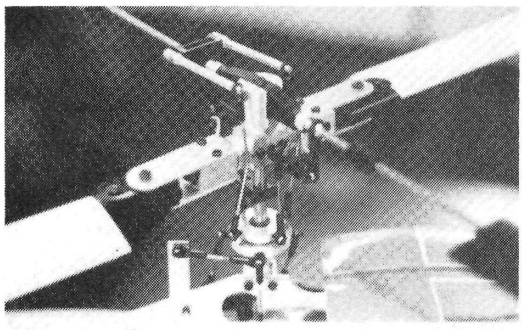
SULLIVAN PRODUCTS
Helicopter Extension Kit

This helicopter extension is for top-down cone-starting past the rotor blades, and it fits all Sullivan starters.

Part no. 612
For more information, contact Sullivan Products, 1 North Haven St., Baltimore, MD 21224.

ROBBE MODEL SPORT
Pitch Gauge

This device is used to set the pitch on main blades, tail-rotor blades and flybar paddles. The pitch gauge is extremely accurate and should be used on all R/C helicopters.
For more information, contact Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.



MINIATURE AIRCRAFT USA
Magna-Pipe & Peacemaker Exhaust

Here's a complete range of high-tech headers, tuned pipes and mufflers—all designed for peak mid-range power, lightness and good sound reduction. There are applications for all popular helis, and all hardware is included.

For more information, contact Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804.

PAINTING

CLEAR HELI CANOPIES

PAINTING FROM THE INSIDE OFFERS DEPTH OF COLOR AND MAR-RESISTANCE. HERE'S HOW:

by A.E. STANLEY

MANY CANOPIES AND FUSELAGES for our machines are made of clear material, so I think it's time we heli enthusiasts adopted some of the painting techniques used in the R/C car world. Most R/C car bodies are made of clear polycarbonates, e.g., Lexan, and they're painted on the inside—that's right, the *inside*. This may sound strange, but after you've tried this method, you might never want to paint on the outside again!

In many ways, it's easier to paint on the inside, and, unlike when you paint on the *outside*, mistakes are less of a problem. If you use the correct paint and take care during preparation, the spraying part is easy! I get the best results with Pactra* R/C Finish paints, which are specially formulated for polycarbonates and are available in spray cans or in bottles (for brushing application). They mix well and come in a variety of colors, but most important, they're flexible and bond well to plastic.

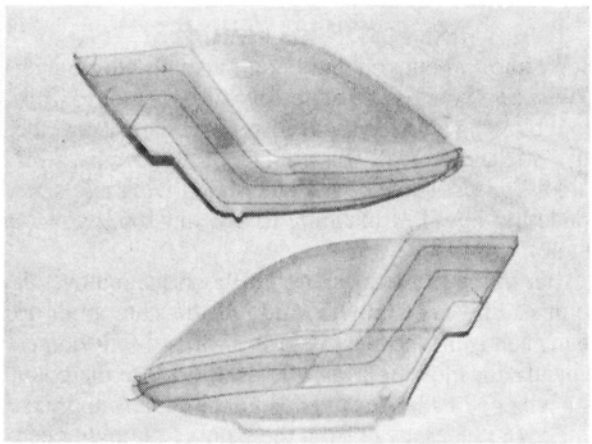
PAINTING PREP

Using whatever tools are required, trim the canopy to fit your helicopter and make provisions for mounts, switch access, etc. Now, you're ready to mask the canopy for your paint scheme.

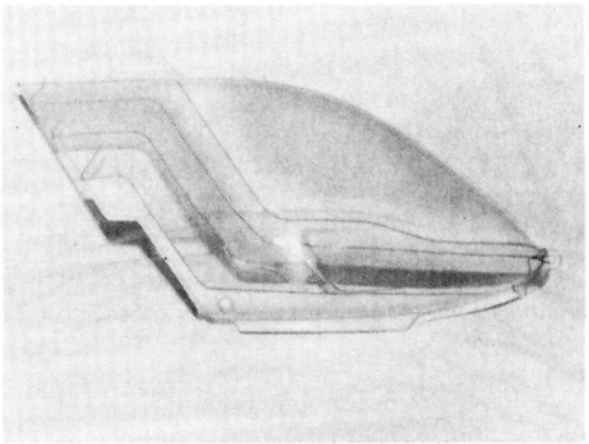
If you want pinstriping between the bands of color, apply 1/8-inch, fine-line 3M tape first (see photo no. 1). This tape is available at auto-paint-supply dealers, or, if you need only a small amount, Pactra sells small rolls. Take your time and rub the tape to ensure good adhesion. You won't be able to change these pinstripes after you've started to paint, so if you're not happy with how the tape looks, take it off and start again. This tape will be the last masking material to be removed.

Now, mask the entire interior surface of the canopy. I use Dave Brown's* Liquid Mask for this. To build up a thickness that can be removed easily later, apply approximately four coats. When this film is thoroughly

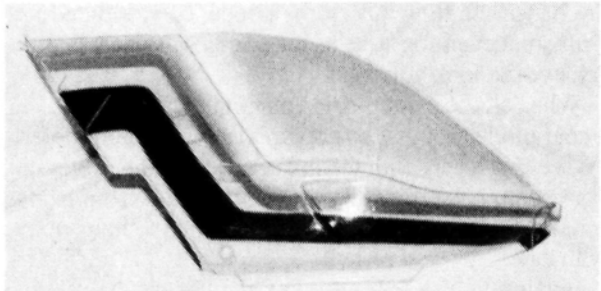
PHOTOS BY A.E. STANLEY



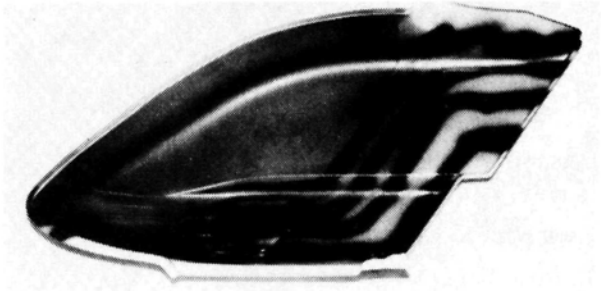
1. Canopy halves are masked and painted before being joined. This makes painting from the inside much easier.



2. Before you paint, apply fine drafting tape (for the pinstriping) and mask the entire canopy—on the inside.



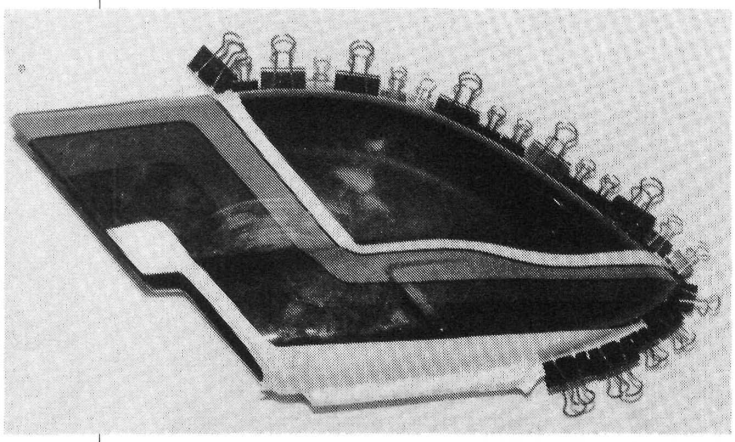
3. Here, the first (darkest) color has been applied, and the masking film has been removed for the next trim color.



4. The canopy's inside surface doesn't look very crisp, but from the outside, the pinstripes are sharp and the colors deep.

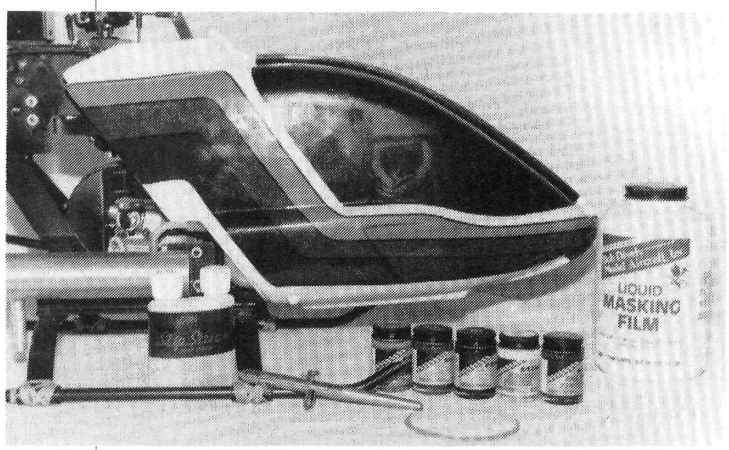
dry, cut it with a sharp hobby knife and peel it off the first area that you intend to paint. If you can't find Liquid Mask, or don't feel comfortable with it, use plastic packing tape, which is available at most hardware stores. If you use the tape, remember: when you paint from the inside, the *first* thing that you mask will be the *last* thing that you paint.

When all the masking is complete (see photo no. 2), you're ready to paint. Please think of your safety and wear a mask. Proper ventilation is also very important. If you own an airbrush, by all means use it; if not, use the spray cans. *Caution:* these cans spray a lot of paint, so test your technique on a scrap piece before you shoot the canopy! (I practice on an old storm-door panel. The results are the same as with plastic, and the panel can be cleaned with thinner and reused.)



5. After all the painting has been done, clamp the halves together and join with CA.

A multi-hued finish is attractive on both an X-Cell (left) and a Cobra (right).



The necessary ingredients: masking film, a good airbrush, tape and paint formulated for polycarbonate, such as Lexan.

Paint the dark colors first; otherwise, they might show through the lighter ones. (In this case, the black pinstripes are really the darkest color, but they must be done last.) To allow the paint to get a good "bite" on the plastic, mist the color on lightly. Several light coats are better than a few heavy ones, and they're less likely to bleed under the tape.

When the first coat has dried, you can peel the next section of masking film off for the second color (see photo no. 3). Be careful not to damage the first color: peel the mask back slowly while making sure that the pinstriping tape is still in place. (It's a good idea to check the pinstripes before you shoot each color.) Repeat the aforementioned steps and apply the remaining colors, making sure that each is fully dry before you continue.

Now, it's time to do the pinstriping. To prevent the black paint from bleeding through the other colors (and to give them uniform opacity), cover all the color bands with a coat of white. When you pull off the striping tape, you'll probably find bleed-throughs here and there, but don't worry: mistakes are easy to hide. Using a sharp object (e.g., a dental pick or a hobby knife), scratch off the unwanted color. Don't worry about scratches in the plastic. The black paint will fill them in, and nobody will ever know they're there! (See photo no. 4.)

THE FINISHING TOUCHES

I don't know about you, but I don't want to see a bunch of wires and servos through my bird's canopy. Talk about blowing any hope of realism! I prefer to "fog" the glass, so that you really have to look to see all that stuff inside! I'm sure some of you older fixed-wing pilots are wondering how I'm planning to dye this thing now—I'm not!

After you peel the masking off the glass, remove all the dust. This takes time because of the static built up when peeling off the mask, and an airbrush really comes in handy for blowing away the dust. Choose the color with which you plan to "tint." Hold the canopy approximately 18 inches away from the gun. (You might need to get further away with the can.) Start on one side, away from the canopy, and "mist" across the glass. Don't stop or change the flow during the stroke, or you'll end up with an uneven fog. Use as many coats as necessary to achieve the look you want.

When all the paint is dry, you might want to spray on a coat of clear epoxy or polyurethane as a fuelproofer. To see if it reacts with the paint, test the fuelproofer on your scrap piece first. To protect the paint from being scratched, consider covering the inside of the canopy with tape.

Finally, you're ready to glue the canopy halves to-

(Continued on page 114)

Helicopter Challenge

by CRAIG HATH

DON'T TRY TO GO IT ALONE!

SOMETIMES, "GOOD" ADVICE isn't that good! This month, I suggest some ways to find the best advice on learning to fly a helicopter.

In past columns, I've focused on helping those who are just beginning this enjoyable, challenging hobby, because they're most in need of information. We've chosen and bought our helicopter, radio system and engine, assembled everything into working order and gathered the necessary support items. We're now ready to start trimming the machine and learning to fly it. At this critical time, you can acquire some really good basic habits—*if* you're given good advice....

Before you attempt to fly your machine, trim it with the help of an experienced flier.

Your eventual degree of skill will depend on your determination and effort, but it will also depend on the quality of advice you're given. When you know how to run your engine and keep your heli in trim and properly adjusted, you're well on your way and can learn the rest on your own. Follow a logical method of flight instruction, and keep your helicopter in good working order.

FINDING GOOD HELP

If there's an active helicopter club in your area, you're blessed, because a club is the best source of good information. To find out if there's one in your area, contact the International Radio Control Helicopter Association (IRCHA) by writing to Don Chapman, 6225 Taylorsville Rd., Dayton, OH 45424.

Another good source of information is your hobby shop, where you'll find people who are involved in the sport. Ask about other heli fliers, and try to visit the fields where they fly. Even if you have to travel some distance, make the effort to visit other fliers a couple of times until you're ready to be on your own.

When you're sure that your new machine has been checked and trimmed properly, you're on your own!

If you find active heli fliers, try to determine the level of their skill. Only those with experience will be able to give you the help you need. Watch the flying to see who the best pilots are, and if you can visit more than one flying site, do so.

If you find a competent pilot who's willing to help, return with your helicopter ready for its first flight, and let him test-fly it for you. Pay close attention and ask questions. If you can only find fliers who are just learning to hop their machines around, *don't* let them fly yours; but accept help with basic trimming, etc. Get involved with other fliers, because camaraderie is a major aspect of this hobby.

Your instructor/helper can tune your engine and set the pitch curves with a test/run-up stand. This device helps you to avoid some of the risks that accompany first flights.

Helicopter Challenge

To start, hover at a low altitude, as Charlie demonstrates. This step is discussed at the beginning of the flight-training scheme that will be presented in the next column.

DON'T FOLLOW THE CROWD

A group of fliers often favors one particular brand of helicopter, engine, etc., or shies away from others. Remember that, if they're used properly, almost all the products connected with this hobby will work as their manufacturers claim. Of course, some products are better than others, but very few R/C heli items are really unusable.

Don't be discouraged if the people you fly with aren't completely enamored with your choice of helicopter or equipment. If you've followed my advice on how to buy your first machine, you'll be in good shape as far as equipment goes.

OTHER PLACES TO GET GOOD HELP

Finding help isn't nearly as difficult as it once was, and there's no excuse for not finding answers to your questions.

Many equipment manufacturers have field representatives or hot-line consultants who can be contacted for help. Many will even meet you. I'm involved in a program like this, and I enjoy helping newcomers, either in person or by phone. If you can, take advantage of this service; it might save you a lot of grief in the long run.

Several mail-order companies now specialize in R/C helicopters, and many of their employees are extremely knowledgeable about the technical and flying aspects of our hobby. Not only are these great places to get questions answered, but they're also great sounding boards for new ideas, and they'll give you information their new products. Check into it.

HELI ED.

When your machine is trimmed-out and debugged, you'll need to follow a prescribed system of flight instruction. I've watched many pilots learning to fly, and I think the method I advocate is one of the best, because it emphasizes learning *control* rather than just crash avoidance.

Credit for this basic flight system is owed to the man who first wrote this column years ago: Walt Schoonard. (Walt now owns Miniature Aircraft USA, which manufactures a great line of helicopters.) In my next column, I'll explain this flight system in detail, and I'll also present a basic flight-trimming guide that will help those of you who are having trouble finding help.

The bottom line is that you can make it on your own, but it will be a long, hard trip if you don't have good advice. ■

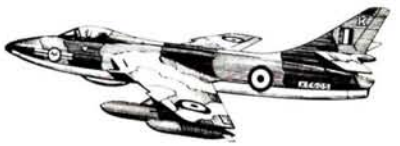
KYOSHO STRATUS

(Continued from page 90)

box—very convenient!—and the quality is good.

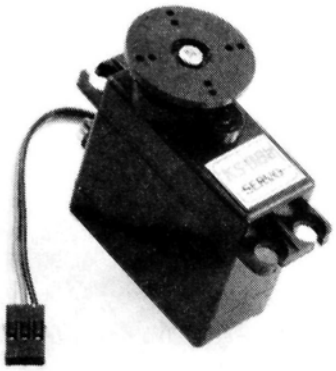
Like most electrics, the Stratus might be too much for beginners to handle on their own, but with the help of an instructor, it makes a nice trainer. With its Selig 3021 airfoil, the Stratus performs well, and experienced fliers will also enjoy flying it. On a scale of 1 to 10, I give the Stratus a 9+!

**Here are the addresses of the companies mentioned in this article:*
***Kyosho,** distributed by Hobbico, 1610 Interstate Dr., Champaign, IL 61821.*
***Zap,** distributed by Frank Tiano Enterprises, 2460 SW 85th Terrace, Davie, FL 33324; House of Balsa, 20130 State Rd., Cerritos, CA 90701; Robart Mfg., 310 N. 5th St., St. Charles, IL 60174.*
***Cirrus/Global Hobbies,** 10725 Ellis Ave., Fountain Valley, CA 92728.*
***KO Propo,** distributed by Global Hobbies.*
***Novak Electronics, Inc.,** 128-C E. Dyer Rd., Santa Ana, CA 92707.* ■



PRODUCT NEWS

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**



KYOSHO
KS-88 Servo

As standard on-board equipment for the Pulsar Pro 2000, Pulsar EXP 2001 and Impulse II radios, the Kyosho KS-88 servo has demonstrated its response and reliability for a variety of R/C aircraft, car and boat uses. It measures $1^{9}/_{16}$x$1^{7}/_{16}$x$^{3}/_{4}$ inches, weighs only 1.6 ounces and delivers 34 ounce/inches of torque. Its compact dimensions make it easy to install, even in restricted areas. The KS-88 is an ideal general-purpose servo for outfitting your models.

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

POWERMASTER PRODUCTS
Break-in Fuel

Powermaster's new Golden Break-in Fuel is specially formulated for breaking-in model engines. Created by well-known engine author Stu Richmond and extensively field-tested, this fuel is compatible with all engine types, including 2- and 4-strokes. A 32-page instruction booklet that describes proven methods for breaking-in all engines is included with each half-gallon.

For more information, contact Powermaster Products, Inc., 7807-H Telegraph Rd., Montebello, CA 90640.

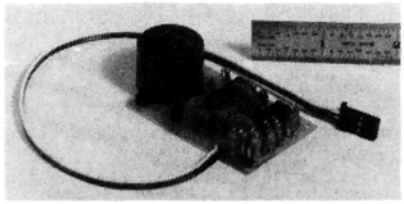
JR
MAX 5 PCM

The MAX 5 PCM (5-channel) aircraft radio system is a high-quality, state-of-the-art system with superb features, including servo-reversing, dual rates, interference/battery fail-safe and double-ratcheted trims for primary control. The MAX 5 PCM's ergonomic design makes it comfortable to hold and operate, and it looks great. Included are the patented ABC&W receiver (PCM G-type, 7-channel), four JR 501 servos, a plug-in transmitter battery pack, rechargeable transmitter and airborne Ni-Cds, a Ni-Cd charger and complete servo accessories and hardware.

Part no. J5PC

Price: $384.99

For more information, contact Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.



TEJERA MICROSYSTEMS ENGINEERING
On-board Safety Accessory

This new onboard safety accessory—the Guardian Angel TM—is an audible, expanded-scale voltmeter (ESV) and power indicator, a battery cycler, an interference monitor, an aircraft finder and a range tester all in one small, light package! Continuous beeps (spaced at various intervals) let you know the condition of your receiver Ni-Cds and remind you that the receiver is turned on. The unit provides a selectable load to discharge your batteries, it determines remaining capacity, and it helps to minimize battery degradation. If your channel is clear, the Guardian Angel produces a constant tone, which can also help you locate your aircraft if it gets lost. Finally, it's a range tester: simply place your transmitter on the ground with the antenna collapsed, and walk away with your plane. When you hear a constant tone, the model is out of range. Units come with tinned leads; male and female radio connectors cost $8.

Price: $39.95 (suggested retail); $29.95 (special introductory price, if purchased directly from the manufacturer).

For more information, contact Tejera Microsystems Engineering, Inc., P.O. Box 340608, Tampa, FL 33694.

WENDELL HOSTETLER'S PLANS
Cessna 206 Stationair

Wendell Hostetler's Plans announces the release of its latest design—a Cessna 206 Stationair. The plans are drawn at 26-percent scale with these specifications: Span - 120 inches; Length - 82 inches; Wing area - 2,080 square inches; Weight - 25 to 27 pounds; Power - 2 to 5hp. They're drawn on two 42x96-inch sheets and include a special three-view. These accessories are available: cowl, windshield and curved rear windows, nose gear and main dural landing gear. Custom kits and 60-inch Edo-type float plans (which may be built in amphibious form with special retracts) are also available. Send SASE for additional plans and information.

Price: $29.50 (postage paid)

For more information, contact Wendell Hostetler's Plans, 1041 Heatherwood La., Orrville, OH 44667.

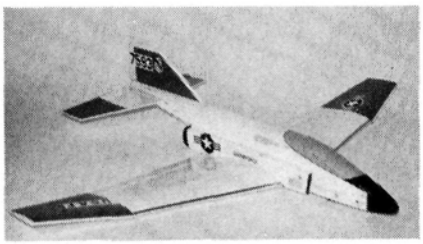
LION MODELS
Safari 45H

The Safari 45H sport trainer comes 92 percent assembled and covered with a thin layer of white plastic with red, yellow and black trim. Landing gear, wheels and a fuel tank are included. Specifications: wingspan - 63 inches; radio - 4-channel; engine - .40 to .51 2-stroke.

Part no. 10498

Price: $199.95

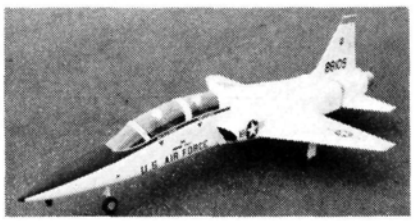
For more information, contact Indy R/C, 10620 N College Ave., Indianapolis, IN 46280.



BAM
F-4 Phantom

Bruce's Aircraft Models announces the first in its "Warbird Series"—the F-4 Phantom. Made of contest-grade balsa and ply, it has a foam-core, bolt-on wing, foam-core tiplets and an optimized 205 airfoil. The F-4 Phantom has a 38-inch wingspan, a 258 square-inch wing area and a flying weight of 19 to 22 ounces. Designed for 2-channel R/C, it accepts all standard R/C gear and can be converted to gas or electric. Top-quality hardware and military decals are included.

For more information, contact Bruce's Aircraft Models, 3941 S Bristol, Suite 93, Santa Ana, CA 92704.



CUSTOM R/C AIRCRAFT
Ducted-Fan Kit

Custom R/C Aircraft's new ducted-fan kit is actually a double one: it can be ordered with the fiberglass fuselage to build the T-38 Talon (pictured) or with another fuselage and wing modification to be an F-5F Aggressor. Both models use Byron or Hurricane fan units, .77- to .90-size engines and Spring Air Retracts. These marvelous fliers have a 48-inch wingspan and an 80-inch fuselage, and they weigh 11 pounds. Kits come complete with a fiberglass fuselage, a canopy, foam-core wings, duct tube, all sheeting, formers, full-size plans and step-by-step instructions.

For more information, contact Custom R/C Aircraft, 1140 Civic Center Dr., Rohnert Park, CA 94928.

PACER TECHNOLOGY
Z-poxy

Pacer Technology (the maker of Zap CA) announces the release of its new Z-poxy construction and finishing system. Available in 5-minute, 30-minute and finishing-resin formulas, these epoxies have exactly the right viscosity, cure rates, texture and strength ratios. This might be the first line of epoxies that can be sanded with ease! Look for Z-poxy's black boxes in hobby shops worldwide: 5-minute—hot pink; 30-minute—lime green; and finishing resin—bright yellow.

For more information, contact House of Balsa, 20130 State Rd., Cerritos, CA 90701; Frank Tiano Enterprises, 2460 SW 85th Terrace, Davie, FL 33324; or Robart, 310 N 5th St., St. Charles, IL 60174.

X-ACTO
Knife Station

The X-Acto Knife Station provides safe, convenient storage for your X-Acto knives. It protects the blades and cleans them, too!

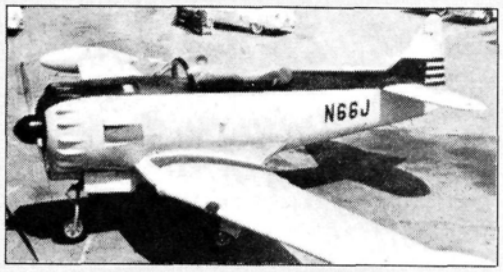
For more information, contact X-Acto, division of Hunt Mfg., 230 S Broad St., Philadelphia, PA 19102.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to Model Airplane News, **Name the Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

CONGRATULATIONS to George Younger of Tucson, AZ, for correctly identifying the Bacon Super AT-6 shown in our June '90 issue! His entry was drawn from the 31 correct ones we received. George sent so much information about the airplane that he could have been the writer of our source material!



As its name implies, the Super AT-6 was a highly modified (and modernized) version of the venerable North American AT-6 Texan, or SNJ, for those of you who prefer water wings. Among the more obvious changes were the tightly cowled 550hp P&W engine, the tricycle landing gear and the one-piece clamshell canopy, which replaced the original's "birdcage" framing. The wingspan was reduced by 4 feet, and 50-gallon wing-tip tanks were added. Options included wing hard points for four 250-pound bombs, rockets or napalm tanks. Attention to drag reduction paid off, as the plane's cruising range was increased by 20 percent, and 45mph was added to its cruising speed.

The company that undertook this project bore the name of its founder, Erle L.Bacon, and was based at the Santa Monica (CA) Airport. Originally developed to allow foreign air forces to upgrade their aging equipment, the Super Six flew for the first time in April 1957.

The AT-6 would make a nice kit-bashing conversion to the Great Planes, Marutaka, House of Balsa, or Ziroli designs, wouldn't it?! ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

PAINTING HELI CANOPIES

(Continued from page 106)

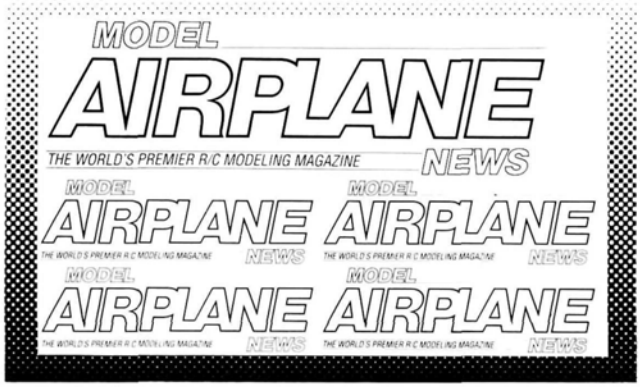
gether. Spring clips (which can be found in office-supply stores) are an inexpensive and effective way to hold them together (see photo no. 5), and thin CA is the best adhesive for this procedure. Apply CA to the inside of the seam, and tilt the canopy to allow the CA to run into and along the seam. Use only enough CA for the section you're working on; never try to do the entire seam at once. Allow the CA to dry, remove the clips and check the job. Some canopies may need extra support, so put a piece of plastic across the inside of the seam to act as a stiffener. I use small plastic screws for this, so I don't have to put glue on the paint.

You've almost finished! All that remains is to remove any overspray and to wax it. Paragon* makes Slip Stream—a product that will take care of both steps and will also be useful for later cleaning and waxing. You might have to order this

(Continued on page 121)

MODEL AIRPLANE NEWS DECALS

By popular demand, we now have 4"x6" sheets of assorted Model Airplane News Decals for your R/C plane. These high-quality, pressure-sensitive decal sheets come in ten different colors. Each color sheet is $2, which includes postage and handling.



Shown smaller than actual size.

Please send me _____ *decal sheets in*

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❒ Day-Glow Blue ❒ Day-Glow Pink ❒ Day-Glow Green

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MODEL AIRPLANE NEWS Decals, 251 Danbury Rd., Wilton, CT 06897

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We at Air Age Publishing would like to expand our line of great books on R/C and are looking for authors.

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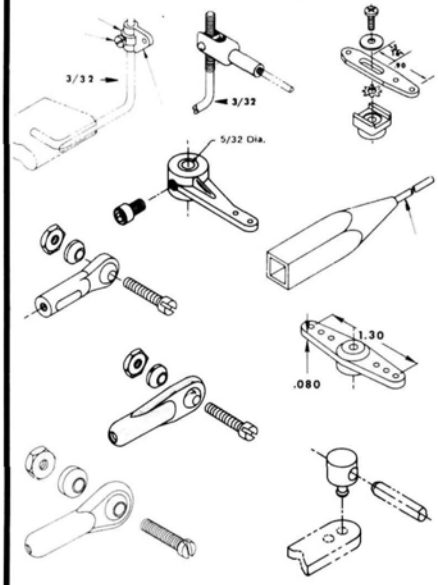

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CLUB OF THE MONTH

R/C

RIVER CITY R/C CLUB

537 3rd N.E., Mason City, IA

THERE'S NO TROUBLE in River City! Our Club of the Month—the River City R/C Club of Mason City, IA—has everything under control. The game of pool may have caused problems in "The Music Man," but R/C planes aren't a force of evil. In fact, a cartoon in the club's newsletter implies that one sure way for parents to keep their kids out of trouble (they won't do drugs or stay out all night) is to get them hooked on the hobby!

The club is very safety-conscious. The newsletter reminds members of the rules, e.g., don't fly alone, always use a frequency pin, and don't fly over nearby farmers or their crops—a big concern in the "corn belt". The River City R/Cers do everything by the rules, it seems. They even have a well-organized parking plan for the club's field! The officers' computer-generated newsletter portraits may look like mug shots, but they're not criminals; instead, they're the "AMA police," who make sure that everyone who flies is a licensed member and that no one is reckless when airborne!

Our Club of the Month enjoys a good turnout at meetings and recently prepared for three events: the Cashwise Cookout (a fundraiser), the Southbridge Mall Show and their second Heli Fun Fly. Last year, the event drew 20 helicopter fliers, some from as far away as the Twin Cities—a 3-hour drive! If modelers in the Midwest are that willing to travel, perhaps the River City fliers will make the trek to the AMA's first National Model and Sport Aviation Site and museum now under construction in Muncie, IN.

The River City R/C Club seems to be doing everything right. Members are safe, considerate fliers who take responsibility for the upkeep of the home field. Beginners who solo are given a certificate for having reached that milestone (or cleared that hurdle!); and members keep a sense of humor about their sport: another cartoon shows a woman at a greeting-card display; she's looking for "a card for a full-grown man who has lost his little airplane"! Yes, our hobby has its ups and downs.

For staying out of trouble and making the most of it, we award the River City R/C Club two subscriptions to *MAN*. Congratulations!

READERS' REPORTS!

MAKE YOUR VIEWS KNOWN!

We'd like you to participate in our "Readers' Reports" program, which was established to give you an opportunity to voice your opinion on products you've used. The guidelines are easy: just send us a brief 3 or 4 paragraphs and a picture or two of any kit you've built or have under way. Tell us what you thought. If we use your report with one of our regular "Field & Bench" reviews of the same product, we'll award you a complimentary subscription to *MAN*. It's that easy. Participate! Make your views known.

Some of the kits now being reviewed:

Ace All Star Bipe
Global Sport Flyer 40L
Yellow Aircraft CAP-10
Miniature X-Cell 30
Hobby Lobby/Graupner Race Rat
O.S. Ryan
Dynaflite Corsair 40
Kyosho Electric Mustang
EZ P-51 Dallas Doll
R/C Design Weasel
Midwest Electric Hots
Top Flite Phasoar
Davey Systems P-47
Lanier Invader
EZ Christen Eagle
Flitecraft Shadow
Ace Seamaster 120
Kyosho Reflex
Hobbico Extra 300
Great Planes Super Decathlon
Robbe Whopper Autogyro

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!
Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

ALABAMA—Huntsville
4.5 miles east of the Alabama Space and Rocket Center. Complete line of Radio-Control, Free-Flight, and Control-Line Airplanes and Hardware, HO&N Scale Trains, Rockets, Ships, and Plastics. Hours: Mon-Fri, 9-6; Sat, 8-5; Sun, 12-5. Daily UPS pickup.
WILSON'S HOBBY SHOP
117 Governors Dr. **(205) 539-2259**

CALIFORNIA—Torrance/Gardenia
Your one-stop R/C shop. We try to carry it all. Major items discounted. Help and advice free. Building and bull sessions allowed on premises. Near LAX. Owner: John Eaton.
MODEL CENTER
2304 Redondo Beach Blvd. **327-3862**

CONNECTICUT—Bristol
15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two-and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov.-Jan. 1-4.
BRISTOL HOBBY CENTER
641 Farmington Ave., Rte. 6 **583-7273**

CONNECTICUT—Norwalk
Connecticut's leading R/C shop, 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.
AL'S R/C SUPPLIES
54 Chestnut Hill Rd. **846-9090**

FLORIDA—Winter Springs
- UPS orders shipped daily
- Dealer for Yellow Aircraft
- Now available "Fastcover" covering material
- NEW–custom building service
- Visit our showroom (35 min. from Disney World)

BOB FIORENZE HOBBY CENTER, INC.
420 W. S.R. 434 **(407) 327-6353**
FAX (407) 327-7148

ILLINOIS—Chicago
Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon.-Fri. 10-9; Sat. 9-6; Sun. 11-4.
STANTON HOBBY SHOP, INC.
4734 Milwaukee Ave. **283-6446**

NEW JERSEY—Red Bank
Full-line hobby shop. Ask us, we will compete with mail-order prices. Mon.-Wed. 10-6, Thr. Fri. 10-8, Sat. 10-5, Sun 12-4.
HOBBYMASTERS
62 White St. **842-6020**

OHIO—Findlay
Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.
JINX MODEL SUPPLIES
721 Rockwell Ave. **422-5589**

OKLAHOMA—Tulsa
R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC. Hours: Mon.-Sat. 10-6, Thurs. 10-8.
WINGS 'N THINGS HOBBY SUPPLY, INC.
5241 S. Peoria Ave. **745-0034**

TEXAS—Austin
Austin's largest hobby shop. Complete line of R/C airplanes, gliders, cars, boats, helicopters, parts & accessories, rockets, kites, R/C systems. Centrally located. Open 7 days a week.
AMERICAN ANGLER TACKLE & R/C HOBBY CENTER
1617 Toomey Rd. **(512) 474-8277**

TEXAS—Houston
R/C airplane specialists, R/C cars, boats, helicopters. Plastic models, rockets, trains, HO & N. "Toys for Big Boys." Mon.-Fri. 11-7, Sat. 10-6.
LARRY'S HOBBIES
156-F FM 1960 E. **443-7373**

LATIN AMERICA
COSTA RICA—San Jose
Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.
EL HOBBY SHOP
Centro Commercial, San Jose 2000
Apartado 529, Centro Colon **32-26-81**

Send sales message and payment to **Model Airplane News Hobby Shop Directory,** 251 Danbury Rd., Wilton, CT 06897.
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Katherine Tolliver.

ADVERTISER INDEX

CLASSIFIED

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis–retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

PLANS ENLARGED, Large Scale Specialists. PC Model Software. Free information. Concept, P.O. Box 669E, Poway, CA 92064; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

ENGINES: IGNITION, GLOW, DIESEL, New, used, collectors, runners. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537.

OLD TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*. It contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $1.75 S&H; Foreign Surface Mail, add $2.75; Foreign Airmail, $5.50; Payment must be made in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

ANTIQUE IGNITION AND GLOW PARTS CATALOG: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid U.S., Foreign $20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

WANTED: RTF U/C planes and U/C race cars, mite cars; complete or pieces, with or without engines. Buy or trade. John Fietze, Box 1521, Amagansett, NY 11930.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

R/C WORLD—ORLANDO, FL, CONDO RENTALS—2-3 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information, call (800) 243-6685 or write Air Age Inc., Condo Dept. 251 Danbury Rd., Wilton, CT 06897.

SALE- Model &Aircraft magazines:1950+, "Model Airplane News," "American Modeler," "Model Builder," "R/C Modeler," "Airpower," "Wings," LSAS(45¢)E. Milton Sheppard, 670 Concord Rd., Glen Mills, PA. 19342.

43-INCH R/C sailboat and 40-inch R/C ocean tug. Both partially built with care. Heathkit R/C equipment included. Cost $650. Sacrifice $175. CHANG, (203) 655-4300 or (203) 625-4821.

HELICOPTER SCHOOL, 5 days and nights, all equipment supplied. Plus room and board on a 67-acre airport with lodge, used exclusively for R/C training. Opening January, 1990, in North Central Florida. Owned and operated by Ernie Huber, 5-time National Helicopter Champion and Helicopter Designer. Plan your winter or spring vacation NOW! Send $2 for complete information package to: R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112-727.

WANTED: Model kits from '40s and '50s. Quality rubber and free flight. Also model race cars. Richard Rundell, 2933 Daneland St., Lakewood, CA 90712.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 2,700 different Foto-Paaks and 5,000+ drawings. Catalog $3. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

SCALE DOCUMENTATION—Drawings, photo packs, monographs, unusual aircraft. Illustrated catalog, $2, pp: Bill Young, 8106 Teesdale, No. Hollywood, CA 91605.

AERO CLUB OF ISRAEL invites new members to learn about aeromodeling in Israel. SASE to: Friends of the Aero Club of Israel, 79-12 212 St., Bayside, NY 11364.

FOR SALE: 40 *Popular Aviation* 1929-1941. *MAN, FA, AT,* Cleveland Plans. $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

INTERNATIONAL AIRCRAFT RESEARCH—NEED DOCUMENTATION? Include name of aircraft for availability of documentation with $3 for 3-view and photo catalog. 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

OLD BUZZARD'S SOARING BOOK: 13 of Dave Thornburg's best essays on R/C glider flying and design. 160 pages, 50 illustrations. $16.45 postpaid. Pony X Press, 5 Monticello Rd., Albuquerque, NM 87123.

STUFF YOUR MAILBOX with hundreds of sources of model aircraft and rocketry. Send $5 to St. George Electronics, P. O. Box 91109, Houston, TX 77291-1208.

SCALE DOCUMENTATION: Detailed aircraft photos, civil, military, Golden Age, etc. Close-ups, markings, nose art, unit badges. Catalog $1.50. AirPhoto, Dept. MAN, 3 Leelynn Circle, Londonderry, NH 03053.

REPRODUCTION PARTS for your Vintage Spark Ignition Engines. For full information on parts available and prices, send S.A.S.E. to D. P. Wilke, Metal Casting Lab, Dept. M.A.N., Idyllwild, CA 92349-9988, phone (714) 659-2460.

ATTENTION: EARN MONEY READING BOOKS! $32,000/year income potential. Details. 1-602-838-8885. Ext. Bk 15272.

SALE - Model and Aircraft magazines; 1950 +, "Model Airplane News," "American Modeler," "Model Builder," "R/C Modeler," "Airpower," "Wings," LSAS(45¢)E. Milton Sheppard, 670 Concord Rd., Glen Mills, PA 19342.

PAINTING HELI CANOPIES

(Continued from page 114)

R/C car product, so look for it when you buy your paint.

If you take your time and follow the steps I've outlined, you shouldn't have any problems painting on the inside. Remember: the key to any good paint job is patience and a clean working area. Now you can take your fabulous-looking heli to the field and show it off!

**Here are the addresses of the companies mentioned in this article:*
***Pactra/Plasti Kote Co.,** 1000 Lake Rd., Medina, OH 44256.*
***Dave Brown Products,** 4560 Layhigh Rd., Hamilton, OH 45013.*
***Paragon Racing Products,** 690 Industrial Circle S., Shakopee, MN 55379.* ■